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THE FOUNDRY is published monthly by The Penton Publishing Co., Penton Building 1213 West Third street, Cleveland, Ohio. JOHN A. PENTON, Chairman, Board of Directors; E. L. SHANER, President and Treasurer; J. R. DAWLEY and G. O. HAYS, Vice-Presidents; F. G. STEINEBACH, Secretary

Subscriptions: United States, Canada and Mexico, $2.00 a year, Great Britain and other Foreign Countries, $4.00 a year; single copies, 25 cents. Copies published three months or more previous to date of current issue, 50 cents each. Entered as second class matter at postoffice at Cleveland under the act of March 3, 1879.

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Member: Audit Bureau of Circulations, Associated Business Papers, National Publishers Association.

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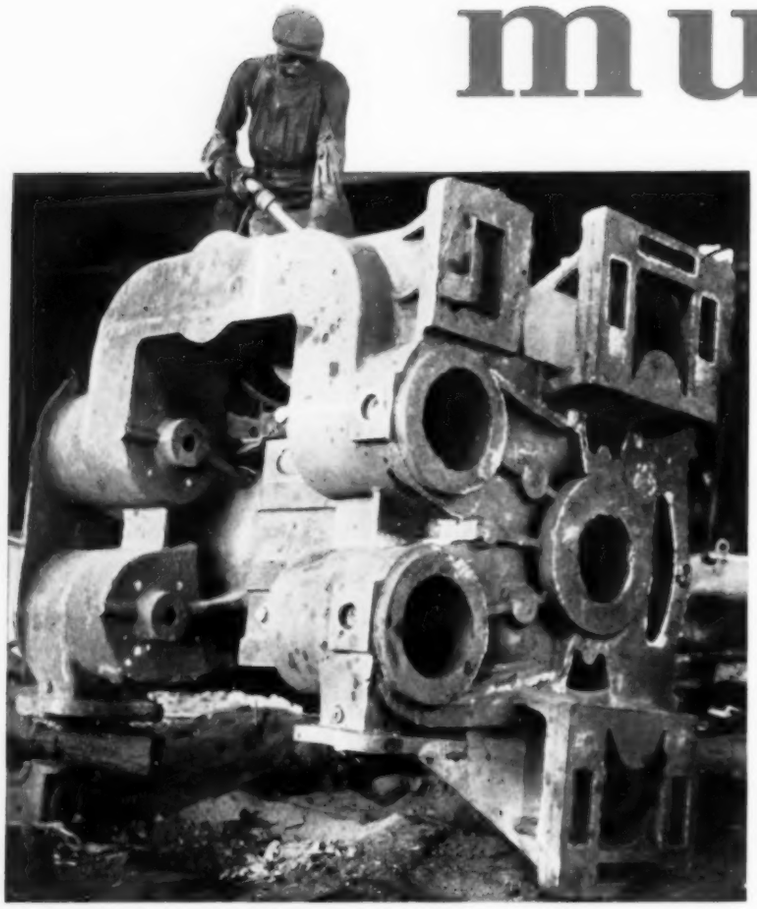

Makers of Meehanite guard their

LI

FULTON FOUNDRY & MACHINE CO.
Cleveland, Ohio

Above: This nine-ton job took 54 man-days of foundry work. It is a steam cylinder block for an ocean-going marine engine. It has over 50 intricately assembled cores. Made of Meehanite, to exacting dimensional and coreing specifications. It has a tensile strength of 54,000 pounds to the square inch and is of uniform crystal structure throughout. Resistant to abrasion, erosion, corrosion, shock, strain and fatigue.

Right: Steam jacket platen bed for rubber belt vulcanizing press. Made of Meehanite. Weighs 31 tons, 36 feet long and 65 inches wide. The core is serpentine shaped, weaving continuously back and forth from side to side. Cores made in six-foot sections and assembled without chaplets. Burned cores blown out. Surfaces after machining free of porosity or any surface defect. Hydraulic test to show complete freedom from seepage or leaks.

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The Foundry Editorial

Foundry Business Will Improve In September, Survey Shows

FOUNDRYMEN in the East and Middle West believe prospects for improvement in foundry operations over the next few months are exceedingly bright, according to a survey recently conducted by THE FOUNDRY and reported on page 25 of this issue. Thirty eight per cent of those participating in the study believe business will be a little better in August, while 53 per cent feel the demand for castings will remain about the same as in July. Looking further ahead, 61 per cent express the opinion that business will be a little better in September than in August, and 16 per cent of those reporting have the faith to predict September business will be a lot better.

Average operation of all plants in the two sections participating in the survey is surprisingly high at 44 per cent of capacity. Reports also indicate these companies are averaging 3½ days of operation a week. Scattered reports from the South show an average of 51 per cent for operation and 3¾ working days a week. Evidently foundries realized some increase in demand for castings during July, in line with a slight improvement in general business.

What is to be the attitude of foundrymen with regard to improvement of production facilities as the industry again moves forward? The survey shows that 19 per cent of companies reporting are considering the extensive purchase of foundry equipment as business conditions warrant, and that approximately 50 per cent are expecting to install equipment to some extent. This remarkable interest surely indicates greater modernization of practices.

If business moves forward with considerable rapidity, as many now believe, it is logical to expect that much of the equipment buying, which has been delayed during the past year, will be released almost simultaneously. Foundrymen will be anxious to get quick delivery, but equipment manufacturers, rushed with orders and working under the new wages and hours bill which limits working hours and provides for overtime, must delay deliveries or increase the cost to the customer. Unless this new equipment can be delivered and installed, the foundrymen will be handicapped in meeting the increased demands for castings from his customers, as was the case in the spring of 1937.

THE FOUNDRY believes that now is the time to prepare for the greatly improved demand for castings, which seems not only possible but highly probable within the next few months.

Research Program Started

AFTER serious consideration on the part of its board of directors, the Gray Iron Founders' society has undertaken the first steps in a research program covering the broad subject of gray cast iron. Initial part of the program will consist in collecting, from all parts of the world, weighing and tabulating all existing engineering data on gray iron, so that the material which is applicable may be available for use by the designing engineer and the salesman. This part of the program will be handled by Battelle Memorial institute, Columbus, O.

Congratulations are due the Gray Iron Founders' society for taking this important step. The program corresponds to a suggestion in the February issue of THE FOUNDRY when it was stated that "If the gray iron industry is to continue its march of progress, future studies must be directed to the correlation of the present possibilities in castings properties with the needs of the entire industrial world."

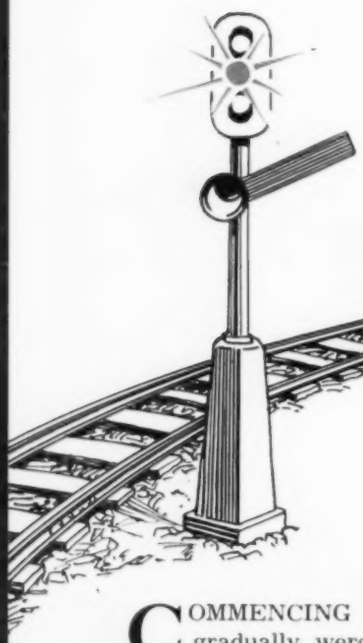
With proper support through membership of all gray iron producing plants, the Gray Iron Founders' society will be able to continue enlarging the scope of its research program, producing data which will permit foundries to meet the engineering needs of present customers and find new uses for castings.

Progress in Detroit

MANY important developments in the practices and products of foundries have originated in plants producing automotive castings. The courage of automobile manufacturers in trying new methods, employing different engineering materials and attempting the thing that always has been considered impossible, continues an active influence upon the entire foundry industry.

On page 33 of this issue, THE FOUNDRY begins a monthly feature which will present the latest foundry information from Detroit, views of the trade and possible future trends as they affect foundry products. This feature is prepared by A. H. Allen, Detroit editor of THE FOUNDRY.

Frank G. Steinebach
Editor



By PAT DWYER

Trains Run on Chilled

COMMENCING about 1753, cast iron wheels gradually were substituted for wood wheels on the primitive type of railroads then in use. No particular attention was paid to the composition of the iron. The process of case hardening or chilling the wheel treads to increase the wearing properties of the wheels was not introduced until 1818.

Railroads had their practical origin in England as long ago as 1600 A. D., and even at that time they were practically the rebirth of an undeveloped idea advanced by the Roman invaders who were highly skilled road makers in the early years of the Christian era.

Strange as it may seem modern steel railroads and luxurious methods of land travel had their origin in the industrial railways that first were constructed roughly to simplify the transit of coal from mines in Durham and Northumberland, to shipping points on the Tyne and Wear rivers in England. At first planks were laid on the bottoms of the ruts in the existing roads. Rough

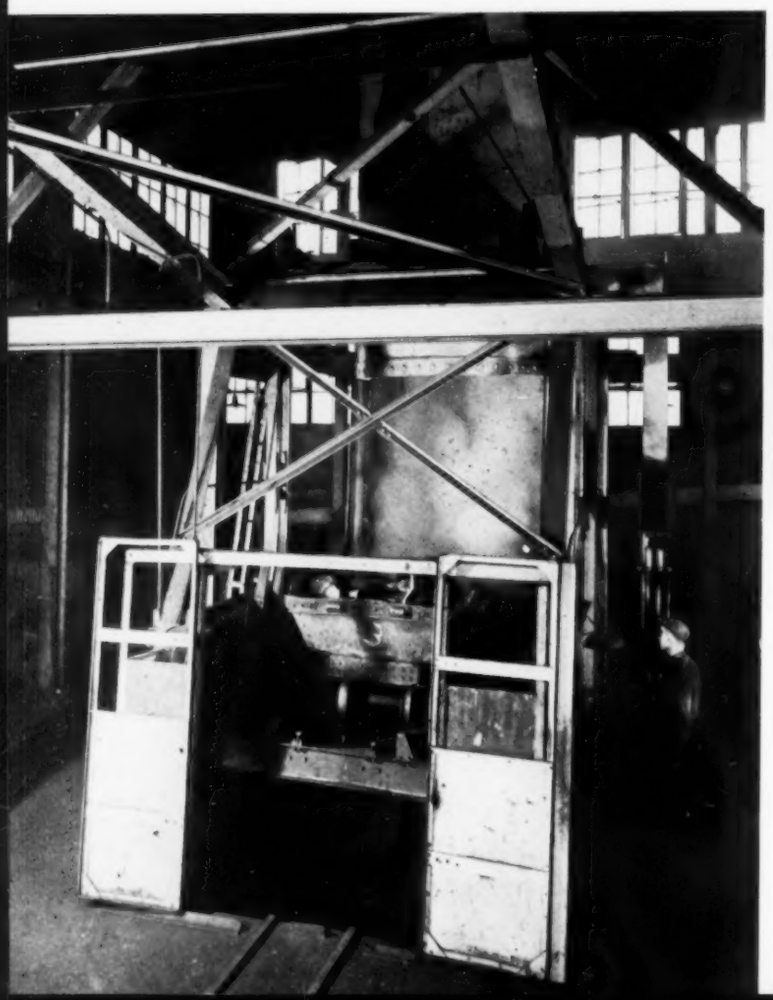


Fig. 1 (Left)—Automatic skip lifts the car and dumps the charge in the cupola. Fig. 2 (Above)—Buggies are spotted on the scale and loaded with a magnet suspended from the yard crane

carts fitted with clumsy wood wheels or rollers and laden with coal and ore naturally made far better progress than formerly. In 1676 planks were placed on the level of the roads with sleepers and cross ties laid underneath at fairly regular intervals. Quoting an old English writer:

Planks of timber were laid from the colliery to the

Car Wheels

river, exactly straight and parallel. Bulky carts were made with four rollers fitting the rails whereby the carriage was so easy that one horse would draw down four or five chaldrons of coals.

What is a chaldron? A chaldron is a nearly obsolete English dry measure for coal, lime, etc., commonly

equal to 4 quarters or 32 bushels, but in London 36 bushels heaped up and in Newcastle double that amount. The weight or measure varied with the locality and always was followed by an explanatory note as for example: The chaldron of coal at New York was 2500 pounds.

This method of construction again was improved by filling in the spaces between the *ways* and sleepers with dirt so as not to interfere with the progress of the horses and mules. At this stage of development of transportation the railroad was known as the way-leave and it was found that a horse easily could pull a load of 4700 pounds as against 1900 pounds over the old rough roads. About 1700 the wood beams were reinforced with long slips of iron to prevent wear. Cast iron rails replaced the iron slips about 1740 and were in quite general use in 1775.

Fig. 3—Scrap wheels are rolled on edge by hand into a shallow pit where a ram shoves them under a drop weight. One blow breaks the wheel into charging size

Instead of a single large wagon several small wagons were linked together, the germ of the modern train, and flanges were put on the wheels instead of on the rails. Shortly after the turn of the century locomotives began to displace horses as motive power and a gradual revolution was inaugurated in practically every item connected with transportation. In the United States the pioneer Baltimore & Ohio railroad was chartered in 1827 and foundrymen were given the first opportunity to supply wheels. At that time and for many years afterward the peculiar features inherent in chilled wheels were so exacting that only three or four foundries in the country were considered competent to produce them.

The Griffin family, commencing with Thomas F. Griffin, were early pioneers in the chilled car wheel industry in the United States and have taken a prominent part in every development down to the present, or for a period of nearly 100 years.

The career of Thomas F. Griffin from the position of foundry apprentice to that of a great industrial executive would give the late Horatio Alger a mark at which to shoot.

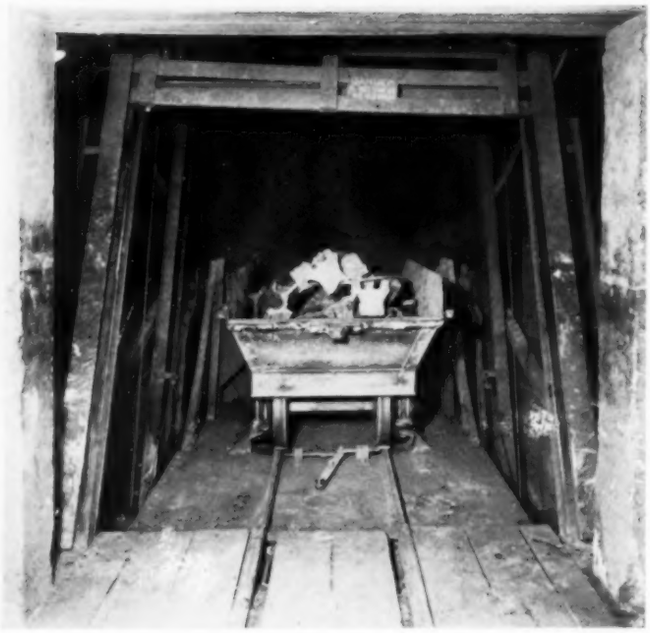


Fig. 4—Narrow gage track from the yard delivers charging cars to the short length of track on the floor of the charging hoist

Thomas F. Griffin was born in the County Limerick, Ireland, December 18, 1826. At the age of eight, he came to the United States and settled at Rochester, New York. Four years after his arrival in this country, steam railroading was started in the United States with the advent of the Baltimore & Ohio Railroad. In 1841 the Auburn & Rochester Railroad was constructed westward as far as Rochester and in the following year Thomas F., at the age of 16, entered the foundry to learn the trade of molding car wheels and other castings needed by the new railroad. When the firm of William Kidd & Co., was organized in Rochester in 1850 to manufacture car wheels the young man of 24 was appointed foreman and remained with the company for 23 years. His two sons, Thomas A. and Patrick H., joined him in the foundry and became experienced wheel molders.

In 1873, the Griffin family moved to Detroit and contracted with the Detroit Car Wheel Co. to operate their foundry. In 1877, the Griffin's struck out for themselves and organized the Griffin Car Wheel Co. of Detroit.

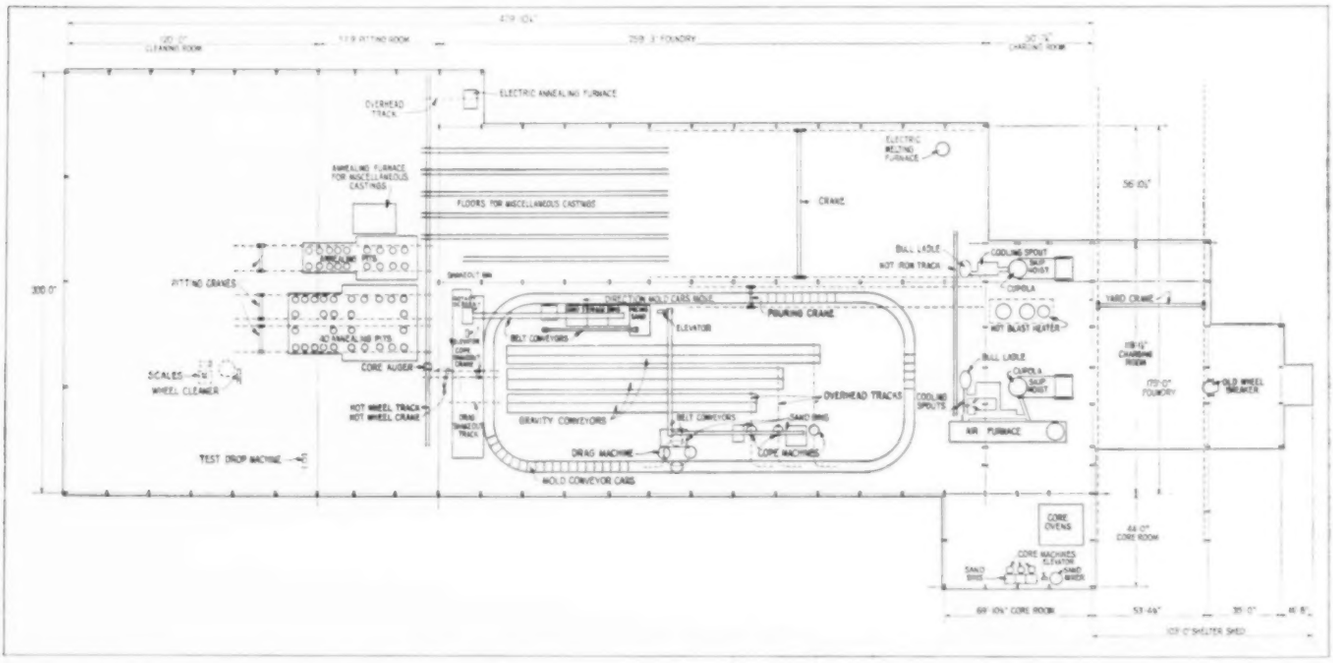
The older son, Thomas A., was born Aug. 28, 1852. In 1868, he started his apprenticeship in the foundry at Rochester and remained with his father in Rochester and Detroit until 1880, when he went to Chicago to explore new territory. On Feb. 21, 1881, he organized the firm of Griffin & Wells to operate a plant on Paulina street south of Blue Island avenue. In 1885, he organized the Griffin Wheel Co. This marked the beginning of an expansion program which eventually embraced car wheel plants at all strategic railway centers from Boston to Los Angeles.

Plants Established in Many Cities

In chronological order a new plant was built in Denver, and placed in operation Nov. 18, 1895. In the same year a plant was purchased in St. Paul. The following year, 1896 a plant was purchased in Tacoma, Wash. The Kansas City, Kans., plant was purchased December 1899 and the Boston plant was acquired in August 1903. A new plant was built in Los Angeles and placed in operation Oct. 9, 1914. The first mechanical unit plant was built in Council Bluffs, Ia., and placed in operation Sept. 1, 1921. New plants were built and placed in operation in Salt Lake City, Utah, Oct. 7, 1927; and in Cincinnati May 23, 1927. The Cleveland plant was purchased in Dec. 1926. At present the Chicago, Detroit, St. Paul, Kansas City, Council Bluffs, Salt Lake City, and Cincinnati plants are operated mechanically with the molds carried on conveyors.

Present organization of plant management consists of four divisions, all handled (*Please turn to page* 62)

Fig. 5—General view of the foundry showing location of the various units from the stock yard at the right to the cleaning and testing department at the extreme left



How Is Business?

By GEORGE A. POPE
Assistant Advertising Manager
The Foundry, Cleveland

SPECIFICALLY, how is the *foundry* business? The answer is set forth in the following summary of results obtained in a survey by mail just completed. Taking a cross-section of foundries, large and small, in the Middle-west and the East, the indications are that:

44 per cent is the prevailing rate of operation of foundries in those sections.

3½ working days a week is average.

53 per cent say that business will be the same in the month of August and 38 per cent say that business will be a little better.

61 per cent expect business in September to be a little better and 16 per cent say a lot better.

66 per cent say that their inventories of raw materials and supplies are fair to low.

67 per cent say that they are investigating new equipment to some extent or considerably, for possible purchase when business warrants.

These are a few of the conclusions which may be drawn from a survey conducted by THE FOUNDRY the week of July 18 among a representative cross-section of foundries in six Middle-western and five Eastern states. Sampling of opinion was taken in approximately 10 per cent of the foundries in these states which, it is believed, yields a reasonably adequate picture of the foundry business as a whole.

Particularly interesting are the returns with respect to present-day foundry operation which, with the exception of one or two states, are found to be relatively well aligned at the sectional averages of 44 per cent capacity, 3½ working days a week. That the average is not thrown out of line either way is indicated by the fact that only 10 per cent of these reporting indicated operation in excess of 75 per cent on the one hand and less than 20 per cent operation on the other. Table II gives the breakdown specifically by the respective states.

As Table I shows, some 53 per cent of opinion has it that business will be about the same in August as in July, in other words, 44 per cent of capacity operation. A substantial number, 38 per cent in fact, say that they expect business to be a little better. Looking possibly to an early release of automotive business, more foundries in the Middle-west expect business to be much better than is true in the East.

The foundry industry apparently joins in the opinion held in other quarters of business that the prospects for September are definitely better as is shown in Table II. Some 60 per cent say (*Please turn to page* 65)

Table I

We have reason to believe that our business in AUGUST will be:

	Middle West Per Cent	Eastern States Per Cent	Combined Average Per Cent
About the same	54	52	53.0
Little better	36	41	38.5
Much better	9	4	6.5
Worse	1	3	2.0

Table II

We size up prospects for business in SEPTEMBER and early fall as:

	Middle West Per Cent	Eastern States Per Cent	Combined Average Per Cent
About the same	11	11	11.0
Little better	64	59	61.5
Much better	18	15	16.5
Uncertain	7	15	11.0

Table III

Our present inventories of raw materials and supplies are:

	Middle West Per Cent	Eastern States Per Cent	Combined Average Per Cent
Low	21	30	25.5
Fair	32	42	37.0
Ample	47	28	37.5

Table IV

To what extent are you studying your production facilities and investigating new equipment for possible purchase when business warrants?

	Middle West Per Cent	Eastern States Per Cent	Combined Average Per Cent
Considerably	26	12	19.0
Some	48	48	48.0
Very little	26	40	33.0

ASTM Sessions

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W. M. Barr
Vice President

H. H. Morgan
Vice President

SPECIFICATIONS and testing procedure for cast products were discussed at several sessions of the annual meeting of the American Society for Testing Materials held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 27 to July 1. A feature of the meeting was a symposium on impact testing presented Tuesday afternoon and evening.

Announcement was made during the week that the next regional conference of the A. S. T. M. will be held in Columbus, O., March 6-10, 1939, and that the 43rd annual meeting with an exhibition, will be held at Chalfonte-Haddon Hall, Atlantic City the last week in June, 1939.

Importance of research as one of the keystones upon which further world progress depends was stressed by Dr. Albert E. White, University of Michigan, Ann Arbor, Mich., and the retiring president of the society at the opening session. Dr. White stated that research enters into the field of agriculture, communication, transportation, public health, energy and the production of industrial products. There is a definite interlocking of all these groups, according to the speaker, and each is dependent for its prosperity and advancement upon the others. All must look to research as one of their foundation stones. Dr. White therefore feels that every encouragement should be given to those individuals and agencies engaged in research so that, through their achievements, research may contribute its share to restoring prosperity, improving standards of living, and adding to the store of cultural values.

Recognition of 13 individuals and organizations holding memberships in the A.S.T.M. since its organization 40 years ago, a review of the progress of the society through the work of its multiplicity of committees, the awarding of honorary memberships and the introduction of officers elected for the coming year, were other features of the session.

Consider Castings

Individuals recognized for 40-year affiliations were: Frank A. Barbour, consulting and hydraulic engineer, Boston; Allan W. Dow, vice president and chief engineer, Colprovia Roads Inc., New York; William K. Hatt, research professor, Purdue university, Lafayette, Ind.; Alexander Jarecki, president, Jarecki Mfg. Co. Ltd., Erie, Pa.; Andrew Lundteigen, vice president, Ash Grove Lime & Portland Cement Co., Kansas City, Mo.; Alvah H. Sabin, chemist, Flushing, N. Y.; Albert Sauveur, metallurgical engineer and professor emeritus, Harvard university, Cambridge, Mass.; and Arthur N. Talbot, professor emeritus, University of Illinois, Urbana, Ill.

Organizations cited for the same tenure of membership were: American Foundrymen's association, Chicago; Bethlehem Steel Co., Bethlehem, Pa.; Booth, Garrett & Blair, Philadelphia; Carnegie Steel Co. (now Carnegie-Illinois Steel Corp.), Pittsburgh; and Franklin institute, Philadelphia.

Membership of the society on June 1 was 4156, according to the report of the executive committee presented by C. L. Warwick, secretary-treasurer. This represents a gain of 164 during the year and brings the total number near the peak of 4400 in 1930.

Honorary memberships were awarded to Dr. Frank O. Clements, technical director, research laboratories, General Motors Corp., Detroit; Dr. William K. Hatt, research professor, Purdue university, Lafayette, Ind.; and Dr. Herbert F. Moore, professor of engineering materials, University of Illinois, Urbana, Ill., for their contributions to the progress of the society. Dr. Clements was introduced by Dr. G. H. Clamer, Ajax Metal Co., Philadelphia, Dr. Hatt by Mr. Bates and Dr. Moore by Prof. F. E. (*Please turn to page* 68)

This is the second of three articles from a paper presented by the author at the Northwestern New York Regional conference held in November, 1937 at Cornell University, Ithica, N. Y. The first article appeared in July, and the third and concluding article will appear in an early issue

Alloy Steels Designed for Specific Uses

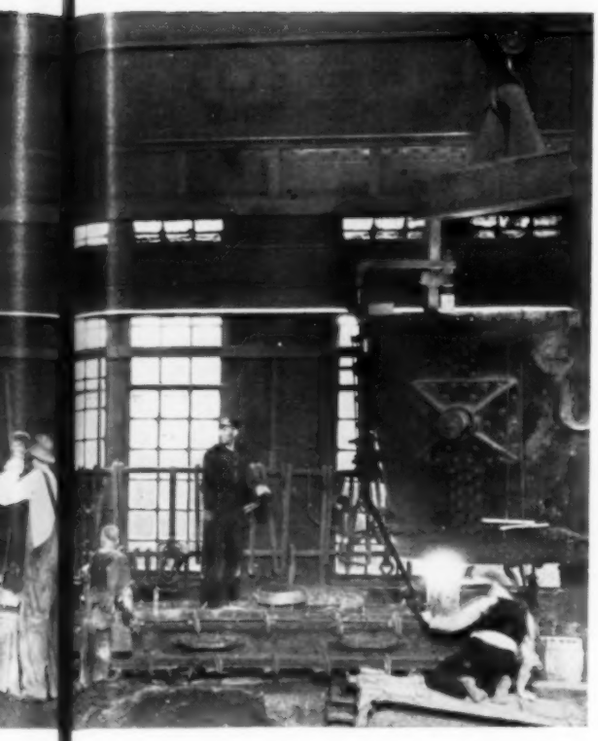
SO MUCH is said about mysterious influences, obscure elements, and infallible nostrums, that the layman may feel the manufacture of special steel is an occult science. This viewpoint is absurd.

It might be well to compare the foundryman and metallurgist to a doctor—one who cures the ills of castings, instead of the ills of men. What does the doctor do first? He makes a diagnosis, and to do this he must first study the symptoms. He inquiries into the habits and experience of the patient, and determines the cause of the trouble. Then he defines the disease and specifies the remedy.

One often hears the expression, "a good sound casting." What does this phrase mean? It is obvious that a sound casting is one free from internal and external defects, for example: blowholes, scabs, shrinkage, cracks, interior porosity, etc. Habits of carefulness and attention to details are as important as skill, brawn and theoretical knowledge; and one who thinks that bad heats are due to the weather or pre-destination is a fatalist and has no place in the modern foundry.

In the years gone by, molders, in making castings, used their own judgment as to condition of the sand, amount of ramming, cutting of sprues and heads to fit the castings. With modern standardized practice, every pattern has standardized heads, runners and gates, determined by the use of the x-ray, the gamma ray, deep acid etching, and from practical experience.

In the manufacture of special steel castings, sand used must be sufficiently high in silica and have a minimum of alkalies to insure the necessary refractory qualities. It must be permeable enough to allow the escape of gases generated within the sand in the mold. It must clean easily and well leaving a good surface on the casting. It must be capable of accommodating itself to the linear contraction of the metal during



By VINCENT T. MALCOLM
Metallurgist
Chapman Valve Mfg. Co., Indian Orchard, Mass.

the cooling, and it must be strong enough to withstand handling and the scouring action of the metal.

Therefore, by proper treatment and handling of sand from which the molds are made, and by constant supervision and control over this phase of foundry technique, elimination of defects from the mold itself certainly follows. Molds for special steels and intricate work should be made of dry sand. Small molds for unimportant castings are usually made of green sand.

Accuracy of analysis control in steel melting may be obtained with uniform accuracy and reasonable consistency, and when there is inconsistency in the melting practice, it shows that little attention has been given to details of operation. If it were possible to obtain exactly the same conditions attending every heat, or with the different types of alloys, we might have an easy time in getting what we want, but there are many powerful influences working to destroy the equilibrium that a man must be alert to bring his heat through and obtain the correct analysis when things do not work out as usual.

Much depends on close observation of the heat of steel all the way through from the start to the finish, regardless of the type of furnace in which the steel is made. It has been common practice in some foundries that when melting practice is operating smoothly, an effort is made to cut down expenses in some way. This brings certain changes which are sometimes converted into trouble.

A change should not be made once the melting practice has been carefully and thoughtfully adopted, unless there is a strong reason for it. Although it is necessary for the melter to depart from a possible schedule of additions sometimes, if the conditions are made as uniform as possible, there should be no need for it often.

In electric furnace practice, once the power is on it should not be taken off, unless absolutely necessary, until the charge is in a molten condition. If there is any work to be done, such as changing electrodes, it should be taken care of before starting, because when parts of the charge are heated from 1500 degrees Fahrenheit to the melting point, excessive oxidation and scaling takes place and the slag becomes rich in iron oxide. This condition is aggravated still more if the furnace is not kept air-tight during the melt down.

Requires Close and Constant Supervision

Operation of furnace practice is too complicated a subject to cover in this discussion but a few words may be said with regard to the addition of the various alloys and the manufacture of special steels. Addition of molybdenum, nickel, etc., does not present great difficulty in the manufacture of steel, but the addition of oxidizing elements, such as chromium, vanadium, tungsten, titanium, collumbium, selenium, etc., presents considerable difficulty.

Heats must be worked carefully and in such a manner as to produce the correct composition in the final steel. Analytical laboratory methods must be such that the determination of any one of the particular elements can be made within a short time and give the melter the necessary information as regards to the condition of his heat before final adjustment.

Success or failure of special steels depends upon the consistency in which heats of the same composition are brought to a standard *condition* before the final additions are made. This *condition* is a phenomenon that one, after watching an electric furnace for a short period of time, cannot miss, as the bath, from boiling violently and frothing like a glass of carbonated water which when poured, becomes flat and quiet, with bubbles breaking here and there.

In bringing about that condition, the slag on the steel plays an important function in furnace operation. Chemically it is a neutralized product of acid or basic anhydrides formed in the furnace from the constituents of the metals or fluxes used. Slags are complex substances, but are associated so closely with furnace practice and the manufacture of good steel, that it is important that their compositions be controlled closely. All additions of alloys to steel should be made in the furnace and never in the ladle, unless required for a special purpose.

Finishing and casting temperature of steel is a subject concerning which there is so much to be learned, that some temerity is required to discuss it. Our rules, therefore, are suggestive rather than dogmatic. Three things largely determine what (*Please turn to page* 76)

I. B. F.

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Senior Vice President

Joseph Hepworth
President

Richard Miles
Junior Vice President

By VINCENT DELPORT
European Manager, The Foundry

BRADFORD, the leading city of the West Riding of Yorkshire, was for the first time the seat of the thirty-fifth annual conference of the Institute of British Foundrymen held June 14 to 17. According to custom, the West Riding of Yorkshire branch acted as host to the conference, as the president of the institute for the year 1938-39 is Jos. Hepworth, member of parliament, managing director of Bradford Piston & Ring Co., Ltd.

This year's conference was well attended and was marked by a selection of interesting papers dealing principally with iron foundry work, steel castings, nonferrous foundry work, particularly in regard to aluminum alloys, and one paper on vitreous enamelling. Official exchange papers were received from the American Foundrymen's association, the French foundry association and the German foundry association. These papers were presented during the two morning sessions of Wednesday, June 15 and Thursday, June 16, and in the afternoons a number of visits were made to neighboring works, comprising the foundries of William Asquith, Ltd., and Modern Foundries, Ltd., Halifax, makers of machine tools, Fairbairn, Lawson, Combe, Barbour, Ltd., Leeds, manufacturers of textile machinery, John Fowler & Co. (Leeds), Ltd., Leeds, manufacturers of diesel engines and tractors, Prince-Smith & Stells, Ltd., Keighley, manufacturers of textile machinery, Hepworth & Grandage, Ltd., Bradford, manufacturers of pistons and piston rings, J. Blakeborough & Sons, Ltd., Brighouse, valve specialists, Thos. Broadbent & Sons, Ltd., Huddersfield, chemical equipment manufacturers, and Hopkinson's, Ltd., Huddersfield, steel founders and valve manufacturers.

A number of social events were held during the evenings, including a civic reception by invitation of the Lord Mayor and Lady Mayoress of Bradford, Alderman and Mrs. Henry Hudson, on Tuesday, June 14, and a reception at the Bradford Technical college by invitation of the chairman, Alderman J. W. Longley, during which a most interesting visit was made throughout the college premises, which comprise a working exhibition of a most comprehensive range of modern textile machinery, and in the course of which visitors were enabled to see the process of manufacture of woolens from the time when the wool arrives in its raw state to the finished product, either in the form of yarn, or cloth, worsted, etc. The banquet was held on the evening of Wednesday, June 15, and was a most successful event.

At the annual general meeting of the members of the institute, which was held in the afternoon of Tuesday, June 14, Tom Makemson, secretary, read the report, which showed that membership to April 30, 1938, had increased by 155 in the 12 months preceding, an increase of 19 being registered by the South African branch. Following the report of the technical committee, the announcement of the award of the Oliver Stubbs medal was made, the recipient being S. E. Dawson, Stanton Ironworks Co., Ltd. The second award of the E. J. Fox gold medal was also announced, the recipient being J. E. Hurst, Bradley & Foster Ltd., Darlaston. (*Please turn to page* 80)

Nonferrous Melting

By N. K. B. PATCH

IN GENERAL, when nonferrous alloys are to be melted in any type of furnaces employed in the modern foundry, certain fundamental principles are involved. Definite precautions must be observed if the best results are to be obtained. Some methods of procedure are more desirable than others if cost figures are to be held at the desired low point and likewise, a wide variety of conditions may be found in the foundry which will influence the individual product.

Charging a furnace has been discussed in previous articles dealing with the furnaces themselves; but the necessity for care in the operation of putting metal into a crucible or furnace cannot be emphasized too strongly. If metal is thrown carelessly into a crucible or furnace it may cause damage that will reduce the life of the crucible or furnace so that renewal becomes necessary, thereby adding to the cost of the product unjustifiably.

There is no good reason why foundrymen should be careless in the operation of charging the furnace or crucible. The fraction of time saved by that practice is a most expensive saving. Carelessness, such as this, can only result in exorbitant costs through high maintenance charges, and a high percentage of rejected castings that will result in costs that cannot meet competition.

Nonferrous ingots or heavy pieces should be preheated, if the preheating can be done without the piece absorbing gas. Metal to be charged in a furnace will not chill the molten metal therein as much if it is warm as if it is cold; but if it has absorbed gases during the warming process, the damage is far more expensive than the small amount of chilling resulting from the addition of the same metal at a lower temperature.

Therefore, if the crucible or furnace will not accommodate the entire charge at first, and it is desired to preheat the remainder of the charge, be careful that this remainder is not placed in a position where it is exposed to underburnt or to hot gases that may not mix freely with the surrounding air by reason of impinging upon those pieces of the charge to be heated.

If gates, risers, sprues and other foundry scrap which is added to the charge, is dirty resulting from adhering molding sand or core sand, a slag will result. This viscous slag will be a mixture of slag and metal and when skimmed off some metal is removed. This slag will stick to the crucible or furnace lining and make a dirty furnace or crucible. It frequently will be carried into the pouring ladle or crucible and may even be poured into the mold, resulting in slag spots in the casting. Thus it will be seen that it is far better practice to clean such foundry scrap thoroughly by sandblasting or tumbling before returning it to the melting department.

Slag May Be Cause of Defect

Foundrymen find defects in castings which they assume are caused by bad molding or by weak molding sand being washed by the force of the entering stream of metal; whereas the real cause is to be found in slag and dross carried in with the molten metal.

Some foundrymen attempt to thicken the slag in the crucible by throwing some floor sand on the bath. That practice may seem to clean the metal satisfactorily, but in reality it cannot be condemned too severely. Small particles always adhering to the crucible or ladle which may be washed into the mold. If a furnace charge has much of that type of dirt, it is far better practice to add some fluxing reagent to reduce the viscosity of the slag or make it thinner so that it may be freed readily from the metal. Then it should be skimmed off carefully. Such a charge should be poured into ingots and as the ingots are cooled, they should be carefully skimmed free of any slag contamination that may have been carried into it in the (*Please turn to page* 84)

Catch Cupola Smoke

PROBABLY in the majority of instances through favorable location, the discharge from a cupola stack does not constitute a nuisance. Foundries usually are not erected in residential districts or in close proximity to other buildings. However, in many instances and over a period of years the characteristics of a growing town or city change to a material extent. The foundry at one time the only building in the district becomes surrounded by residences, factories or mercantile establishments of one type or another. Residents or occupants of these buildings view the flame from the stack with a certain degree of apprehension, and resent the dust, smoke and cinders that permeate the atmosphere when the cupola is in blast.

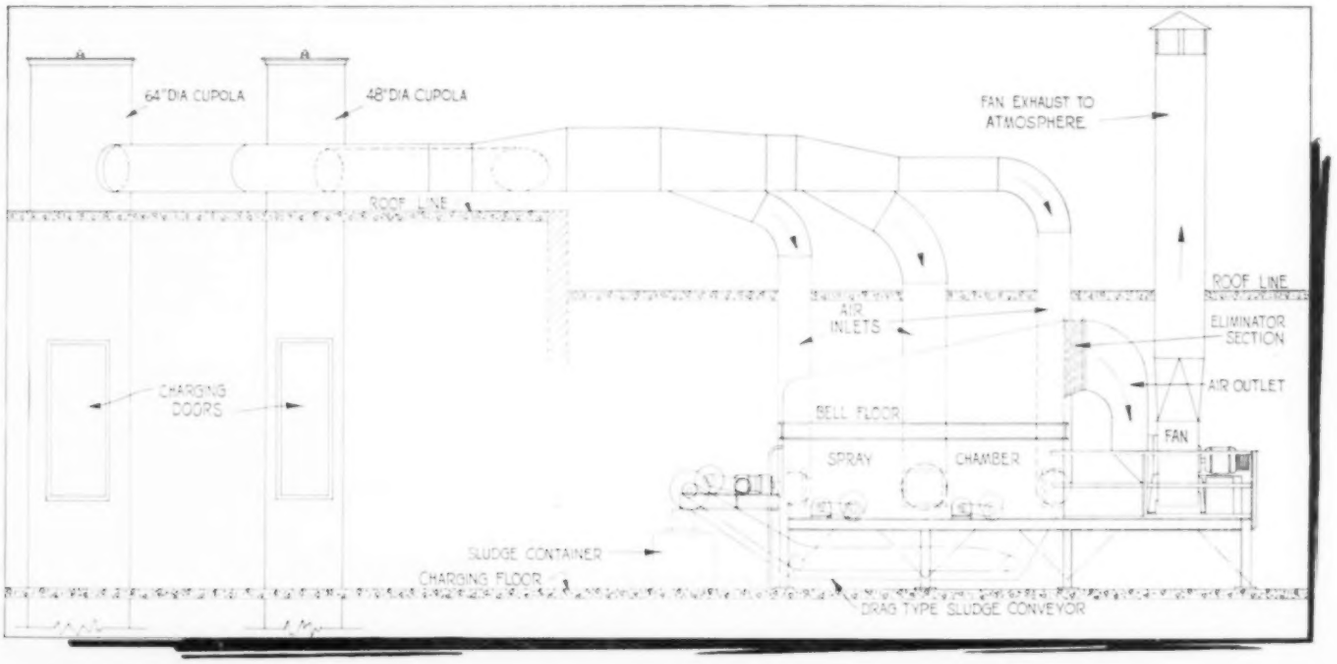
Where the resentment is not expressed openly the foundryman keeps his fingers crossed and prays for a continuance of the status quo. Where the situation becomes a little more acute, where individuals or organized delegations present oral or written protest, the foundryman is placed in a rather embarrassing position. Where a disgruntled neighbor either on his own initiative, or more probably with the active advice and connivance of a fee hungry member of the legal profession, threatens to bring suit for heavy damages, the foundryman finds himself out on the end of a limb.

At a recent regional foundry conference a gray iron foundryman in this uncomfortable position tossed the problem into the general discussion mill with the result that the wheels temporarily ceased to grind. Several members confessed to finding themselves in a somewhat similar predicament, but up to the present had not found any answer to the problem. The item, with several others familiar to all foundrymen, tended to promote insomnia, but as with the weather, what could one do about it? Following the example set by the late Mr. Micawber they mentally shoved the problem into the pigeon hole marked "Where Do We Go From Here?" and resigned themselves to waiting for something to turn up.

May Be Seen in New England Foundry

Unlike the late Mr. Micawber, whose optimism usually led to his being caught off base and put through the wringer, their faith has been rewarded. Something has turned up. As a matter of fact a practical and successful installation for elimination of the cupola nuisance has been in operation for more than a year in a prominent New England gray iron foundry. The plant is not open to the public, but through the courtesy of the management interested persons may arrange a visit.

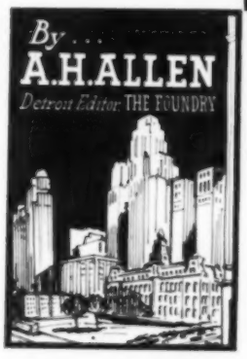
General features and detail of the installation were worked out by the plant engineering staff in collaboration with the C. O Bartlett & Snow Co., Cleveland. Main item in the installation is a slightly modified wet dust type dust collector made by this company. For the benefit of readers who want their data in condensed or capsule form the pertinent features are presented in the accompanying box. Others (*Please turn to page* 86)



Sectional view showing piping and equipment for handling the gas from the cupolas

Among Detroit Foundries

—*Photo Courtesy W. B. Crawford*



PERHAPS nowhere in the world is there the continual pressure to stimulate development of new foundry techniques and equipment that exists in Detroit, the focal point of the automotive industry. Not a day passes without some word, official or off-the-record, of an automotive plant, or a castings supplier, pushing into new fields for foundry products. Hence it is fitting that THE FOUNDRY should keep its readers posted on what is transpiring in Detroit as far as castings are concerned, what is being talked about in the trade, and what appears to be in store for the future.

How extensive a user of castings is the automobile industry? Data on this question are meager, but two examples will give an approximation. Chevrolet statisticians state a typical 1938 model embodies 450 pounds of cast iron compared with 1930 pounds of steel. A Ford metallurgist breaks down the weight of a finished V-8 to show 1770 pounds of steel, 149 pounds of copper-silicon steel castings, 357 pounds of gray iron and 36 pounds of malleable iron, or a total of 542 pounds of castings.

Assume 500 pounds as the average weight of castings per motor car—and this probably is well on the low side. Then last year's production of somewhat over 5,000,000 motor vehicles in the United States and Canada required two and one-half *billion* pounds of finished castings, or a neat 1,250,000 tons. Weight of metal melted probably would come close to twice that total.

Naturally that tonnage is far from static, even assuming a steady level of auto output. There is a continuous interchange between castings and forgings, with stampings coming into the picture occasionally. One year a certain part will be forged; the next year improved foundry practice may dictate a change to castings, while another cast part may revert to a forging because of some peculiar advantage.

It would be foolish and untrue to say there is a definite swing toward elimination of either castings or forgings, because all the technical brains of producers of both are directed constantly toward achieving improved qualities, and particularly lower costs for automobile manufacturers. It is fortunate the automobile industry changes its models rather completely every year, since it permits utilization of the latest ideas in equipment and methods, with the field open to all.

At the moment the use of castings in automobiles appears in the ascendancy. Ford Motor Co. for one is making rapid strides in the application of castings to parts formerly forged.

At Ford's Rouge plant in Dearborn is probably the largest production foundry in the world, with 33 cupolas, over 20 electric furnaces and related equipment for melting, molding and pouring, stretching over 30 acres of property. Recently it was proposed to erect an 8-acre addition to these facilities for casting operations incident to a new small car program, but tabling of the latter project has postponed for the time being the extension of foundry buildings.

Well over half a million dollars is being expended right now in improvements to present facilities. Noteworthy is the progress being made with centrifugal casting of such parts as ring gears and transmission cluster gears. A battery of centrifugal casting machines is now in regular production on these parts, and it is likely the method will be extended in the near future to numerous other parts, such as wheel hubs and cylinder liners.

There is nothing particularly new about centrifugal casting, as many plants in this vicinity use the process on iron, steel and nonferrous castings. Advantages of the method are that the whirling action produces a dense structure at the outer rim of the casting, and parts can be produced close to finished size with a minimum of indirect metal to be taken off after cooling. The dense outer structure of centrifugally cast iron makes it ideal for such parts as gears.

Ford has been using green sand cores on certain jobs. Hydraulic molding machines are used in this connection with average (*Please turn to page* 66)

QUESTIONS and ANSWERS

Desires Method of Estimating Iron Casting Weight

What is the method usually employed for estimating the weight of iron castings from the blueprints?

Since a cubic inch of cast iron weighs 0.26-pound, the weight of the casting can be estimated from the drawing, by calculating the number of cubic inches represented. On plain shapes this is done by multiplying the length, breadth and thickness. On more intricate shapes the figure is broken down into as many parts as may be considered necessary. The cubical content of each part is estimated and then the cubical contents of the various parts are added for the final estimate.

Formulas are available for computing rapidly the cubical content of practically every shape. An extended illustrated description of the methods and formulas for estimating the weight of castings is contained in the *Foundryman's Handbook*. A highly informative and detailed article on the subject appeared in THE FOUNDRY, June 1933 issue. This article entitled "Estimating Weights from Blue Prints," was written by John H. Hill.

Crusher Jaws May Be Made From Iron or Steel

In an issue of THE FOUNDRY we noticed a discussion of chilling steel castings. It mentioned crusher jaws, and stated steel castings were not chilled. We were under the impression that crusher jaws are made of cast iron containing a high percentage of manganese, and would like information on their production. Are the jaws chilled on the crushing side, and do they have to be machined on the seating side?

Crusher jaws are made in both 14 per cent manganese steel, and chilled iron. The question and answer you mention probably referred to the former. When made of cast iron the crushing face is cast against a chill to insure an extremely hard, wear resistant surface. The back seldom is machined unless it is not cast straight, and in that case it probably would be necessary to machine so as to have a solid bearing to prevent breaking.

Composition of the iron for crusher plates will depend upon thickness, and silicon usually is under 1 per cent. In most cases alloy irons are used. For example one recommended composition shows 0.60 to 0.80 per cent silicon, 0.30 per cent maximum phosphorus, 0.70 to 0.80 per cent manganese, 0.25 per cent nickel, and 0.50 per cent chromium. Another contains 0.40 to 0.50 per cent silicon, 0.150 to 0.18 per cent phosphorus, 0.50 to 0.60 per cent manganese, 4.40 to 4.60 per cent nickel, and 1.40 to 1.60 per cent chromium.

Placing Cast Blocks Inside Keel Mold Is Feasible

We have an order for a 12-ton cast iron keel, but have ladle capacity for only 10½ tons. Could we cast a number of blocks with a gross weight of approimxtely 2 tons, place them in the mold and then fill the mold with molten metal?

Your proposed plan of placing a number of cast iron blocks in the keel mold is quite feasible and practical. In fact in the old days when many foundries were smaller than they are now, the practice was quite common. So much so that these fillers were known colloquially as *dutchmen*. An article by T. D. West published many years ago in THE FOUNDRY, refers to the practice of stacking pig iron in open formation in the inside of certain large molds for the same purpose. Since sandblasting was unknown in these early days, presumably he had some other method for cleaning the pigs before they were placed in the mold.

You realize of course that the inserts must be perfectly clean and dry so that the metal will not kick and blow away from them. While you are making the *dutchmen* you might as well cast a small one around each of the pipes for forming the bolt holes. With this reinforcement there will be no danger of the molten iron causing the pipes to collapse, crush or bend. These pipe casings may be 3 or 4 inches thick and constructed to a diameter of approximately 3 inches where they touch the top and bottom of the mold.

For the shape and size of the larger blocks we suggest a uniform thickness of 6 inches and a depth conforming to the shape of the bottom of the mold so as to provide a thickness of 3 or 4 inches of molten iron above and below. Length will depend on number of pipe cores; one block between each pair of pipes. You

can cast 2-inch diameter projections top and bottom to serve as chaplets. The bottom chaplets will rest on suitable bearings in the bottom of the mold. Pieces of plate may be bedded in the face of the cope, or individual chaplets may be applied in the usual manner. Precaution also suggests the use of a few chaplets along the side to prevent the blocks from shifting.

Aluminum Castings Contain Pits and Small Holes

We have experienced trouble with aluminum castings. A number requiring a high polish contain pits and small holes. Can you give us any information which will aid in correcting our difficulty?

Without having a specimen casting to examine to determine definitely the type or types of defect, we only can suggest possible causes which include melting at high temperatures, holding the alloy in the furnace too long at too high a temperature, pouring at too high temperatures, pouring with the lip of the ladle high above the sprue opening, and possibly wet sand, hard ramming, etc.

However, our opinion is that the castings are pin holed as the result of gases being absorbed by the molten metal, and partially ejected before complete solidification occurs. Aluminum alloys should be melted and poured at the lowest possible temperature since the higher the temperature employed, the greater the tendency to absorb gases, and to promote coarse grain structure. Our suggestion would be to pour a few castings using a pyrometer to determine the lowest temperature at which the castings can be run successfully. Then set the pouring temperature at 50 to 100 degrees above that minimum to allow time for skimming, carrying to floor, and the pouring operation itself. Melting temperature should be held as close to that as possible also.

Blowholes in Iron Castings May Result From Sand or Iron

We find blowholes in gray iron die shoe castings—plain disks from 3 to 4 inches thick and from 1 to 2 feet in diameter. For these castings we add steel rails to the extent of 10 per cent of the charge. Our regular iron shows the following approximate analysis: Silicon 2.10 per cent, manganese 0.61 per cent, sulphur 0.07 per cent, total carbon 3.40 per cent. We have tried various types of gates and risers but without any effect so far as elimination of the blowholes is concerned.

Holes in a casting may proceed from any one of three, or from a combination of two or three causes: Gas in the metal as it comes from the cupola or ladle; steam from hard or wet sand; and shrinkage. Where the holes are due to a single cause, that cause readily may be distinguished by the characteristic appearance of the surface of the cavities. Where the holes are caused by two or three of the foregoing factors, the diagnosis is not so easy. In the present instance we are inclined to the opinion that the holes are caused by your sand and your molding practice. The sand is either too close, too hard or too damp and the metal does not lie on it quietly.

Bubbles of steam attempt to escape through the metal and some of these bubbles are trapped by the congealing metal to form blow holes. You can determine this point by pouring one of the molds without a cope. If the metal boils and bubbles, the remedy is obvious. Your metal composition should not shrink to any excessive extent and therefore if the mold is not responsible for the holes, the remaining probable cause is gas in the iron. This condition is found where a high blast is employed, especially where steel forms part of the charge. This form of defect is practically certain to appear if the metal is not melted exceedingly hot. The metal in the ladle may be cooled to a considerable extent before it is poured into these chunky castings, but it should leave the cupola at a temperature of approximately 2700 degrees Fahr.

Anneals Rod Castings Made In Permanent Molds

We are casting a half round rod ½-inch diameter about 16 inches in length. We have made some of these castings in a water cooled cast iron mold, but the castings are chilled and therefore objectionable to our customer. We understand that some foundries employ a semipermanent mold, fire clay or plaster of parts which can be used repeatedly. Can you refer us to any book or other literature on this subject?

Since you have constructed iron molds for these castings it would seem that the most logical solution of the problem is to continue using them. By heating the chilled castings to a bright red and allowing them to cool slowly they will become quite normal, provided the silicon content in the mixture is approximately 2.50 per cent. A temporary or permanent furnace readily may be built for the purpose, fired with oil, gas, coal or coke. Size of the furnace and operating detail naturally will depend on the volume of castings to be treated. Reference occasionally appears of clay semipermanent molds used in China for the production of rice pots, but up to the present we have seen no description of the exact composition of the material.

Number of castings made in the same mold usually is set down as *several*. So far as we know no molds of this kind are used in United States foundries. Plaster of paris is not sufficiently refractory to withstand the heat of molten iron. A mixture of fire clay and silica sand, thoroughly dried and with the face blackwashed possibly might be used five or six times, but by that time we are inclined to the opinion that the face would be scaled and pitted and require more time to patch than would be required in making an ordinary sand mold. Also the castings would be rough and unsightly.

Considering all the factors involved, we doubt if you can improve on the ordinary sand casting method with, say, 10 patterns in a snap flask 12 x 20 inches, 3-inch cope and 3-inch drag and with the molds made on a power squeezer machine.

Oven Temperature Is Too Low

Can you give us any information on annealing gray iron frames? The question in our mind is whether a medium size cast frame placed in a core oven overnight and allowed to cool will warp as much as a casting not so treated.

Since the temperature of a core oven as usually operated, is comparatively low, it is problematical whether any benefit will be derived from trying to anneal a gray iron casting in such an oven. Another point that makes us rather dubious about results is the fact that from your description, the oven is beginning to cool off when the castings are placed in it. Aging or strain relief of gray iron castings can be accomplished with comparatively low temperatures such as obtained in a core oven, but the time required is exceptionally long, say from 24 to 48 hours.

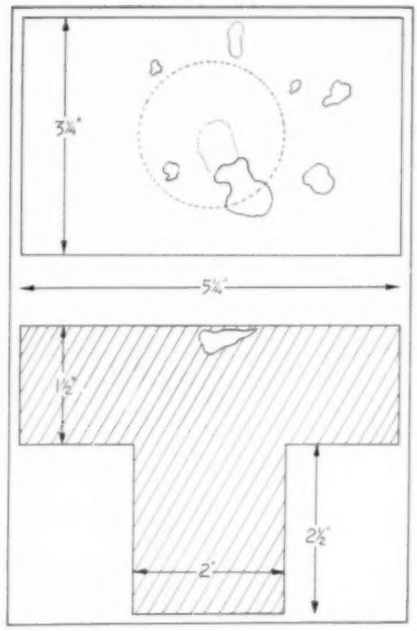
Hence, it is advisable to use much higher temperatures ranging between 900 to 1000 degrees Fahr. The time required is reduced considerably, and the usual practice is to maintain the castings at the elevated temperature for 1 hour for every inch of thickness of the heaviest section. Then the castings are permitted to cool slowly, preferably in the furnace. At 900 to 1000 degrees, there will be little if any loss in physical properties. If you desire to secure easy machinability, higher temperatures around 1500 degrees Fahr. with slow cooling will have to be employed.

Gas and Shrinkage Cause of Holes

We are forwarding a punch press holder casting which developed a number of holes principally on the top side after it was machined. We shall appreciate your opinion on the probable cause and how to prevent this form of defect.

Holes on the top of this casting represent a common form of defect and are caused by a combination of steam and shrinkage. Steam is the direct cause since it forms bubbles in the metal. The bubbles develop a skin and where a number are in combination or close together they interfere with the natural shrinkage of the metal even where a riser is provided. The smaller holes exposed on the upper surface are the former homes of steam bubbles. The large hole in the center was formed when the metal shrank down into the lower part of the casting and no liquid metal was available on top to compensate for this natural shrinkage.

If the casting had been made



Plan and sectional view of casting showing location of blow and shrink holes

singly in a flask filled with sand of proper density and permeability, this form of defect would not appear. Presumably, following usual practice, four or more of the castings were poured in a flask. On account of the depth to which the casting extends in the drag, and the comparatively bulky character of the casting, the sand between the castings was raised to a higher temperature than usual, with a consequent increase in the volume of steam generated. Some of the steam entered the metal. Some of the steam worked its way through the metal and escaped, but a sufficient volume was trapped to form the cavities which later condemned the casting. You readily can verify this theory by pouring metal into an open mold and watching the iron boiling as it rises. Obviously, the remedy is to space the castings further apart in the flask and if necessary vent between them with a wire.

Many Factors To Be Studied in Sand

On our heavy green sand and skin dried castings we use a facing sand showing a permeability of 75 while the heap sand has a permeability of 70. The new sand in the mixture has a permeability of 200, average fineness 66 and clay content 20 per cent. The facing is mixed in a muller type mill, 36 parts old sand, 12 parts new sand and 3 parts sea coal. We have trouble with buckles and scabs. Apparently the sand is too close. How would you suggest opening it up.

For many sands a clay content of 20 per cent would be considered rather high, but with your new sand showing a permeability of 200, it should be quite satisfactory either for heavy green sand or skin dried molds. The fact that the permeability drops so sharply when this sand is mixed with old sand, would seem to indicate that the old sand is too old, that is it has been used too often and therefore the amount of fines is too high. Partial relief might be secured by adding a certain amount of coarse sharp sand to the facing mixture, but the only real remedy is to remove the fines by some form of dust collecting device.

Your reference to the addition of sea coal to the facing varies so widely from common practice, that we wonder if the figure is not a typographical error. The mixture as given contains 36 parts old sand, 12 parts new sand and 3 parts sea coal, that is 1 part coal to 16 parts sand. The usual amount is 1 part coal to 8 parts sand for heavy castings. Another apparent discrepancy, or if not a discrepancy then an error in practice is shown in a permeability of 75 for the facing and a permeability of 70 for the backing sand. This constitutes opposition to both theory and practice. The permeability of the facing is a fairly important factor, but certainly the permeability of the backing sand should be higher. Possibly the sand itself is responsible for certain defects on your castings, but so many other contributory factors may be present, that a sweeping indictment cannot be pronounced against the sand. Other factors to be investigated include ramming, venting, gating, moisture content and method of drying the molds.

Castings Are Hard And Show Leaks

Shells for our door check castings are causing trouble through hardness at the extremities and leakage at the junction point under the flanges. In the cupola charge made up of 40 per cent pig iron and 60 per cent shop returns, the analysis of the pig iron shows: Silicon, 3.50 per cent; sulphur, 0.026 per cent; manganese, 0.091 per cent, and phosphorus, 0.68 per cent. This mixture should give 3.00, or better, silicon in the castings. We have been told that if we raise the graphitic carbon content to 3.40 per cent the hardness and leakage will disappear.

Raising the graphitic carbon will produce a softer iron, but we fail to see how any change in the metal composition will affect the leakage. In our opinion the leaky areas are caused either by the mold or the core. Hard, tight sand either in the mold or in the core exerts a mild chilling effect on the thin

sections especially at the extremities, or points farthest away from the gate. The leaky areas under the flanges most probably are caused by a slight fluttering of the metal in the vicinity. In a thicker casting this gas would escape before the metal sets, but in the present thin section, some of the gas remains in almost microscopic form and results in porous or spongy metal.

The remedy is to use a more open sand in these corners, ram it softer or vent the corners with a wire. Nickel is used extensively to prevent hard spots and hard extremities. With your present metal the addition of nickel shot, approximately 0.50 per cent, should serve your purpose. The shot may be added at the spout, in the mixing ladle, or directly to the metal in the hand ladles with which presumably the castings are poured. Incidentally we are wondering if the manganese content of the pig iron as given in your inquiry, 0.091 per cent, is not a typographical error. In the event that you want to try an alternative method for making the castings machinable, this can be done by heating them to a temperature of approximately 1000 degrees Fahr., and then allowing them to cool slowly.

Steel Pipe Resists Metal Pressure

We have an order for a cast iron keel 20 feet 6 inches in length, 22 inches maximum width, 32 inches maximum depth, weight about 12 tons, with nine 1 15/16-inch diameter cored holes for 1¾-inch bolts. To form these vertical holes in the casting we propose to use heavy steel pipe filled with core sand. On former castings we filled the pipes with a core sand mixture made up of 5 parts local beach sand, 1 part molding sand, 1 part used core sand, ½ part flour and a small amount of core oil. We always have had a great deal of trouble in removing this material from the casting.

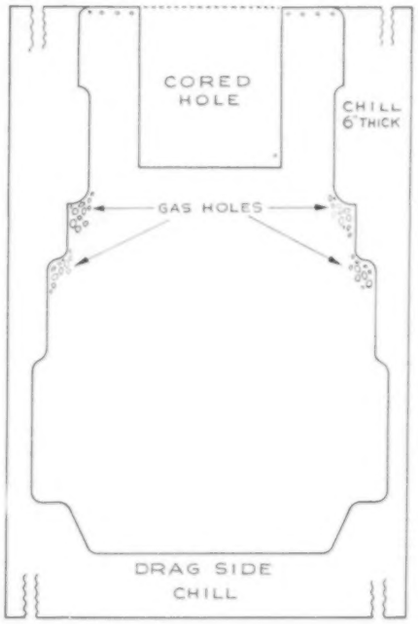
The only reason for filling the steel pipes with sand is to prevent them from collapsing under the combined heat and pressure of the molten iron. The clay content of your present mixture fuses at the high temperature to which it is subjected and later under pressure vitrifies into a solid mass. Obviously the remedy is to provide a highly refractory core, without any fusible element. The type of silica sand employed in steel foundry practice is the most suitable for the purpose, but the beach sand which you now use, if not contaminated with shells, is a fairly satisfactory substitute.

The sand is mixed with fine sawdust in the proportion of 1 part sawdust to 6 parts sand and bonded with a minimum amount of oil or any other form of binder, say half the amount usually employed in regular cores. Stand a ¾-inch rod in the center of the pipe and ram the sand around it. Then withdraw the rod to form a generous vent hole through the core. The sharp sand will not fuse and the sawdust will burn out to release the individual grains. Suitable vent holes, of course, are provided in the cope for the ready escape of gas. Presumably the mold will be gated at both ends, with the first inlet gates near the bottom and with larger gates at or near the top. The metal should be poured at as low a temperature as possible and the gates should be arranged to deliver metal in streams that do not impinge directly on the pipes.

Coating Material Is Not Responsible

We find gas holes in a bottle mold cast in a chill 6 inches thick. Metal is poured through a core gate on top. The chill is coated with a mixture of lamp black, shellac and denatured alcohol. The gas holes develop principally at the shoulders and to a lesser extent at the top as show in the accompanying illustration. If the coating is responsible for the trouble we shall appreciate your opinion on a suitable material to use.

The principal function of coating on a chill mold is to preserve the surface of the mold from direct contact with the molten metal. Manifestly this coating must be an inert material that will develop no gas when raised to a high temperature. Addresses of manufacturers who make special coating material for roll and car wheel chills may be found in the advertising pages of THE FOUNDRY.



Gas holes appear under the shoulders and under the core at the top

In another branch of the foundry industry, so called permanent molds are coated with a thin film of kaolin or china clay mixed with water glass. The face of the mold is smoked with an acetylene torch each time it is used. However, and this is the most important feature, the molds are maintained at a temperature of approximately 400 degrees Fahr., all the time they are in use. This treatment prevents the accumulation or condensation of moisture on the surface. Either moisture or rust (iron oxide) will produce gas holes in a casting.

It is possible that the inside of the chill in the present instance was not rubbed clean with sand or emery paper, particularly in the corners before the coating was applied. Possibly the chill was not heated sufficiently to drive off all the moisture, or it may have been standing on the floor long enough to cool off and condense moisture from the atmosphere. The gas holes on top of the casting may be caused by early ebulition in the metal, or may be caused by a hard core against which the metal will not lie quietly. The ideal way to pour the casting would be through a whirl gate at the bottom after the manner employed in the roll shops. The rapid whirl keeps any bubbles or foreign material in motion and prevents them from adhering to the walls of the mold. This suggestion does not apply in the present instance since the mold is made, but it might be filed away for future use.

Abrasives Brush Off On Wire Wheel

Can you give us information on the method of obtaining an abrasive face on bronze and aluminum thresholds? We have trouble with the abrasives brushing out when put on the wire wheel.

Abrasive faced treads or thresholds are produced by coating the mold face with the desired abrasive which is held in place by some type of binding agent such as sodium silicate (water glass), molasses water, or clay wash. The procedure is to spray the mold face with the binding agent and, apply a thin coating of abrasive through a sieve or screen of the same mesh as the abrasive. Then the mold is sprayed again, and a second coat of abrasive applied. The mold face then is skin dried, or the mold baked so as to insure no excess moisture being present to cause kicking of the molten metal. The metal should be poured as hot as possible to provide good penetration of the molten metal between the abrasive grains.

Charles F. Bunting

H. M. St. John

Herbert H. Blosjo

J. O. Klein

MEN of INDUSTRY

HARRY M. ST. JOHN, chief metallurgist, Detroit Lubricator Co., Detroit, recently has been placed in charge of the nonferrous foundry, the Crane Co., Chicago. Mr. St. John was born in Canajoharie, N. Y., Nov. 29, 1888 and was graduated from Cornell university, Ithaca, N. Y. in 1910. For 3 years he was research chemist, National Carbon Co., Cleveland, and then became research engineer, Commonwealth Edison Co., Chicago. During 1918 and 1919 he was a captain in the chemical warfare service, United States army, engaged in the manufacture of lewisite at Willoughby, O. Following the war he became service manager, Detroit Electric Furnace Co., and remained in that organization until 1923 when he became connected with the Detroit Lubricator Co. Mr. St. John is a member of the American Institute of Mining and Metallurgical Engineers and chairman of the Detroit section; a member of the American Foundrymen's association and past chairman of the nonferrous division; a member of the Electrochemical society and past secretary-treasurer of the electrothermic division; and a member of the American Chemical society, American Society for Metals, Engineering Society of Detroit. Mr. St. John has been active in committee work in numerous societies, is an author of a number of papers for their transactions and also has contributed extensively to the technical press.

♦ ♦ ♦

CHARLES F. BUNTING, recently made superintendent of the Mal-Gray Castings Co., Cambridge City, Ind., and Middletown, O., first became connected with the foundry industry as metallurgist with the Danville Malleable Iron Co., Danville, Ill., in 1920. He left that firm in 1932 to accept a similar position with the Decatur Malleable Iron Co., Decatur, Ill. From 1933 until 1935 he was in charge of furnaces and laboratories at the Ironton, O. plant of the Dayton Malleable Iron Co., leaving there to reorganize the metallurgical practice of the Southern Malleable Iron Co., East St. Louis, Ill., where he remained until his present connection. Mr. Bunting is a member of the American Foundrymen's association, and has been active in the affairs of the St. Louis chapter and the regional conferences conducted at Rolla, Mo.

♦ ♦ ♦

J. O. KLEIN, general superintendent Southern Malleable Iron Co., East St. Louis, Ill., recently was elected chairman of the St. Louis district chapter of the American Foundrymen's association. Mr. Klein was educated as a pharmacist and secured his first foundry position as production clerk for the Vermillion Malleable Iron Works, Hoopeston, Ill. During the war he was superintendent for an auxiliary plant of the Emergency Fleet Corp. and later was superintendent of the Buckeye Jack Mfg. Co., Alliance, O. He then became superintendent for the Cadillac Malleable Co., Cadillac, Mich., superintendent for the Jarecki Mfg. Co., Erie, Pa., and for one year was general superintendent, Decatur Malleable Iron Co., Decatur, Ill. In 1933 he was made general superintendent of the Southern Malleable Iron Co. at East St. Louis.

♦ ♦ ♦

HERBERT H. BLOSJO, metallurgist, Minneapolis Electric Steel Castings Co., Minneapolis, recently was elected chairman of the Twin City Foundrymen's association. Mr. Blosjo was graduated from Winthrop, Minn. high school in 1923 and from the University of Minnesota in 1928. He then served as chief chemist of the Minneapolis-Moline Power Implement Co., Minneapolis. In 1930 he became connected with the Minneapolis Electric Steel Castings Co. as metallurgist and has occupied that position since. He is a member of the A. F. A., and A. S. M., and is serving on the steel division committee on heat treating of steel castings of the A. F. A.

♦ ♦ ♦

J. R. ADAMS, since 1920 foundry superintendent, Lebanon Steel Foundry, Lebanon, Pa., recently was appointed general superintendent, Crucible Steel Castings Co., Lansdowne, Pa.

♦ ♦ ♦

F. ELLIS JOHNSON, dean of the college of engineering, University of Missouri, has been appointed dean of the engineering college of the University of Wisconsin, to fill the vacancy caused by the retirement of Dean F. B. TURNEAURE.

♦ ♦ ♦

L. D. CHRISTIE JR., for the past 3 years assistant foundry metallurgist, American Manganese Steel division, American Brake Shoe &

(*Continued on page* 40)

STRONG *statements are* SAFE *statements...*

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NICKEL CAST IRON

● Check over the requirements for *modern* Diesel Engine castings. You'll agree they have to incorporate strength. And a stubborn resistance to wear and to softening under heat.

Allyne-Ryan are safe enough in claiming these properties for Ryanite, a high-test Nickel-chromium Cast Iron.

Furthermore, this foundry's production methods and intelligent alloying give assurance of density in widely varying metal sections of each casting and ready machinability.

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MODERN CASTINGS

RYANITE cylinder and crankcase casting for a 12 cylinder marine Diesel engine produced by us.

As higher speeds and service are required, the use of our RYANITE Alloys become more and more essential to you as a user of the type of casting pictured above.

Our Pattern Department will be glad to work with you on your wood or metal patterns or alterations of same.

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THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Continued from page* 38)

Foundry Co., has been made foundry metallurgist, brake shoe and castings division, American Brake Shoe & Foundry Co., Mahwah, N. J. From 1932 to 1935, Mr. Christie was industrial research fellow at the Massachusetts Institute of Technology, Cambridge, Mass., in the department of industrial co-operation.

♦ ♦ ♦

WESLEY D. LOW, Knoxville, Tenn., has been appointed sales representative by the Lewis-Shepard Sales Corp., Watertown, Mass.

♦ ♦ ♦

WILLIAM ARTHUR has been appointed manager of the Philadelphia district office, Allis-Chalmers Mfg. Co., Milwaukee.

♦ ♦ ♦

EDWARD F. KLICK, Rochester, N. Y., has been made special sales engineer of the Connecticut Blower Co., Hartford, Conn. in New York state.

♦ ♦ ♦

ROBERT T. FORBES, 201 Devonshire street, Boston, has been appointed representative in the New England territory for the American Engineering Co., Philadelphia.

♦ ♦ ♦

H. A. RICHMOND, for 21 years treasurer and general manager of the Abrasives Co., Niagara Falls, N. Y., resigned that office and was elected chairman of the board recently.

♦ ♦ ♦

A. S. BONNER, formerly secretary-treasurer, Clark Equipment Co., Buchanan, Mich., has been made executive vice president. L. L. LYONS has become treasurer and G. E. ARNOLD, secretary.

♦ ♦ ♦

WILLARD FRAY has joined the laboratory staff of the Ferro Enamel Corp., Cleveland. Mr. Fray, who formerly was with the Floyd-Wells Co., Royersford, Pa., will specialize in cast iron enameling work.

♦ ♦ ♦

EMERSON FRANTZ has been made general sales manager, Bohn Aluminum & Brass Corp., Detroit. Mr. Frantz has been with the Bohn organization since its formation, and has been active in both production and sales work.

♦ ♦ ♦

W. W. ROSE, executive vice president, Gray Iron Founders society, Cleveland, has been elected president of the Cleveland chapter, American Trade Association Executives, at the annual meeting of directors. He succeeds CLAYTON GRANDY, secretary-manager of the Cleveland Clay league.

♦ ♦ ♦

CHARLES W. BRIGGS, physical metallurgist, Naval research laboratory, Washington, will join the staff of the Steel Founders' Society of America, Cleveland, on Oct. 1 in the capacity of technical engineer. Mr. Briggs is a graduate of Stanford university. Since taking his degree in metallurgy, he has devoted most of his time to research work for the U. S. navy, being at present the directing head of the steel castings research department. Most of his investigations have had to do with steel casting development work. Mr. Briggs is well known for his many

Charles W. Briggs

contributions to recent technical literature in the steel casting field. He is author of numerous papers and articles in the technical press. He is a life member of the American Foundrymen's association and the 1937 recipient of the William McFadden gold medal of the A. F. A. Among the projects which Mr. Briggs will initiate in his new connection will be the development of a cast steel data book for the use of engineers, designers, engineering students etc. He likewise will handle other technical phases of the society's activities.

♦ ♦ ♦

RAY H. MOORE, 18863 Rivercliff drive, Cleveland, has been appointed representative in the sale of foundry grinders in Northern Ohio by the Hammond Machinery Builders, Inc., Kalamazoo, Mich. Mr. Moore is well known in the foundry field, and has sold foundry equipment in that section of Ohio for many years.

♦ ♦ ♦

HAROLD E. YALE, long associated with the automotive industry in Detroit, has been elected president, Pyro-Electro Instrument Co., Detroit. CLARENCE E. SMITH is vice president and chief engineer, and CHARLES H. HITCH is secretary-treasurer. The firm recently moved to larger quarters at 7323 West Chicago boulevard.

♦ ♦ ♦

RAYMOND SZYMANOWITZ, formerly technical director, Acheson Colloids Corp., has been appointed vice president and technical director of Acheson Industries, Inc., technical development company for the Acheson interests. In his new capacity, Mr. Szymanowitz will continue supervision of all research activity of Acheson Colloids Corp., Port Huron, Mich.

♦ ♦ ♦

R. E. TAYLOR has been appointed sales research manager by Norton Co., Worcester, Mass. This position was formerly held by MILTON P. HIGGINS who has been made resident manager of the Norton electric furnace plant at Chippawa, Ontario. Mr. Taylor has been connected with Norton Co. for about 17 years and for the last 12 years has been in sales work in the Chicago district.

♦ ♦ ♦

ROBERT LEMUEL SACKETT, dean of the school of engineering at Pennsylvania State College, from 1915 to 1937, recently was presented with the Lamme medal by the Society for the Promotion of Engineering Education, for achievement in this technical field. Since his retirement Dean Sackett has devoted himself largely to the work of the Engineering Council for Professional Development.

♦ ♦ ♦

GEORGE F. BEGOON has been appointed sales manager in charge of commercial activities of Westinghouse Electric & Mfg. Co.'s Precipitron, one of the newest developments in air cleaning equipment. This follows centralization of manufacture and sales of that development in the company's Cleveland division. Mr. Begoon formerly was connected with the new products division in East Pittsburgh, Pa.

♦ ♦ ♦

WILLIAM J. DALY, formerly Detroit district sales manager, Worthington Pump & Machinery Corp., has been transferred to the corporation's Philadelphia office to succeed C. H. Shaw, who died recently. Graduated from Notre Dame university in 1922, Mr. Daly joined the Worthington organization in the same year as a student engineer. Since that time he has held various important positions in the corporation. He will be assisted by W. J. VAN VLECK, recently appointed assistant manager in the Philadelphia district.

♦ ♦ ♦

EARL T. MCKINNEY recently has become connected with the pattern department of the Key Co., East St. Louis, Ill. Mr. McKinney served his apprenticeship in the pattern department of the Missouri Pacific Railway Co., Sedalia, Mo. and then entered the pattern department of the General Steel Castings Corp., Granite City, Ill. Two years later he accepted a position with the

(*Concluded on page* 42)

There's Gold in your Black Sand Pile

YOU don't have to go prospecting to find gold. It's right in your black sand pile. Reclaim your sand, use it with Truline Binder*. You'll save plenty, and your cores and molds will have surfaces smooth as a varnish finish.

Many foundries are obtaining low core room costs by using reclaimed sand and Truline Binder. Let us tell you about them. Our service men will show you how to improve results and reduce expenses.

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(*Concluded from page* 40)

Mountain City Foundry & Machine Works, Greenville, S. C., serving that company four years in the pattern department. He then returned to the General Steel Casting Corp.

• • •

CARL ZAPFFE, JR., has been appointed a research associate at Battelle Memorial institute, Columbus, O. He has been assigned to an investigation of the solubility of oxides in liquid iron and steel, fundamental research on which some previous work has been done at Battelle. Mr. Zapffe is a graduate of Michigan College of Mining and Technology and of Lehigh university, and recently fulfilled the requirements of Harvard university for the degree of D. S. He was previously employed for 2 years in the metallurgical division of E. I. du Pont de Nemours & Co.

• • •

EDWIN C. BARRINGER, editor, *Daily Metal Trade*, Cleveland, recently was appointed executive secretary, Institute of Scrap Iron and Steel Inc., to succeed Benjamin Schwartz. Practically all of Mr. Barringer's business career has been devoted to the publishing industry. During 1912-1917 he was political reporter for daily newspapers in Cleveland and Columbus. In 1917 he joined the Penton Publishing Co., Cleveland, publisher of THE FOUNDRY and other business papers. He was in turn Washington and Chicago editor of the Penton publications, managing editor of *Steel*, and editor of the *Daily Metal Trade*. Born 46 years ago, he studied for two years at Case School of Applied Science and Western Reserve university, Cleveland.

• • •

GEORGES MORESSEE has been appointed president of the Association Technique de Fonderie de Belgique. He succeeds J. Leonard, who recently withdrew because of ill health. Mr. Moressee, past-president of the Association of Engineers of the Ecole de Liege and general manager of the Exposition Internationale des Sciences et de la Grande Industrie de Liege in 1930, was awarded the gold medal of the Liege Association of Engineers in 1926 for studies relative to questions of physique. He is chairman of Compagnie des Compteurs et Manometres, Liege, and chairman of Societe Anonyme, Liege. He is a commander of the Order of the Crown of Belgium, commander of the Order of the Crown of Italy, and has been the recipient of several other orders.

• • •

JOSEPH HEPWORTH, M. P. (see page 30), elected president of the Institute of British Foundrymen at the recent Bradford meeting, began his career at the age of 10 years in a textile factory in Bradford, Yorkshire. At the age of 15 he went as an engineering apprentice to the firm of Thorton & Grebbin, Bradford. Some time later he was appointed manager of the firm of E. P. Grandage (Tools) Ltd. of which he remained general manager for 12 years. Throughout the years during which he started his industrial career he attended night schools up to the age of 24. After relinquishing his position with E. P. Grandage (Tools) Ltd. Mr. Hepworth became associated with his father, one of the founders of Hepworth & Grandage Ltd., Bradford, manufacturer of pistons, piston rings, valves, etc. In 1931 he was elected a member of parliament from Bradford, and again in 1935. He retired from the firm of Hepworth & Grandage Ltd. in 1933 as managing director, and now is chairman and managing director of the Bradford Piston & Piston Ring Co. Ltd.

• • •

W. B. LAKE (see page 30), recently elected senior vice president of the Institute of British Foundrymen, was educated at Witham, Essex and Greifswald, Pomerania. He served his apprenticeship with Barnard & Lake, a firm of agricultural engineers, and later became works manager. In 1894 Mr. Lake started in business for himself as an engineer. Later he was joined by E. F. Elliot and the firm of Lake & Elliot was established. That firm became a pioneer in the manufacture of steel castings, being the first to produce successfully low carbon crucible steel castings. Mr. Lake was president of the London branch for 2 years, held the office of treasurer for 7 years, and for the past year was junior vice president.

• • •

MAJOR RICHARD MILES (see page 30) recently elected junior vice president of the Institute of British Foundrymen, comes from a family which has been directly engaged in the iron founding business for many generations. He was graduated in Mechanical engineering from Sheffield university and after completing his works apprenticeship spent 6 months in a German plant at Duisburg. On the outbreak of the World war he was transferred to the Third Battalion of the Yorkshire Light Infantry and Machine Gun corps in France and Palestine; being demobilized in March, 1919 with the substantive rank of major. Immediately after the war he was appointed assistant to the general manager, Newton, Chambers & Co. Ltd., holding the appointment for 8 years until he succeeded as general manager, and later became a local director. In 1932 he was appointed general manager and director of Head, Wrightson & Co., Ltd., and a year later was made managing director. Major Miles always has been interested keenly in the development of not only foundry technique, but also of markets. As an example, during the housing shortage of 1926, Newton, Chambers made hundreds of complete dwelling houses of cast iron.

Discusses Effect Of Molybdenum

Climax Molybdenum Co., 500 Fifth avenue, New York, recently has published a 127 page book in loose-leaf form which is entitled, "Molybdenum in Steel". It is divided into 13 sections consisting of an introduction, chromium-molybdenum steels, nickel-chromium-molybdenum steels, nickel-molybdenum steels, carbon-molybdenum steels, manganese-molybdenum steels, silicon-molybdenum steels, elevated temperature steels, corrosion resisting alloys, nitriding steels, die steels, high speed steels, and cast steels. Information is given on characteristics, applications, properties and typical heat treatments of the various steels.

Book Review

Legierungen der Platinmetalle Patentsalmlung (Alloys of the Platinum Metals-Patent Review), by A. Gruetzner and C. Goetze, paper, 536 pages, 7 x 10 inches, published by Verlag Chemie, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co. Ltd., London. Printed in German, this volume is an excellent compilation of chemical patents issued in Germany, England, France, Austria, Switzerland, and the United States from 1886 to May, 1937. It is a part of *Gmelins Handbuch der anorganischen Chemie* (Gmelins Handbook of Inorganic Chemistry), and the various alloys are arranged in tables in alphabetical order. In each table the first column is devoted to the composition with percentages if available, the second to the properties or applications, and the third to the inventor, patent number, and country of origin of the patent.

Only a comparatively slight knowledge of German is required to use the book since the various elements are given in the Latin symbols, and the tables begin with an alloy of Ag-Ir and end with one containing Cu-Fe-Mo-Ni-Pd-Rh-W-Zr. In addition the back section of the book contains tables listing the various alloys according to the contained platinum group metal or metals, with a reference to where it appears in the front section.

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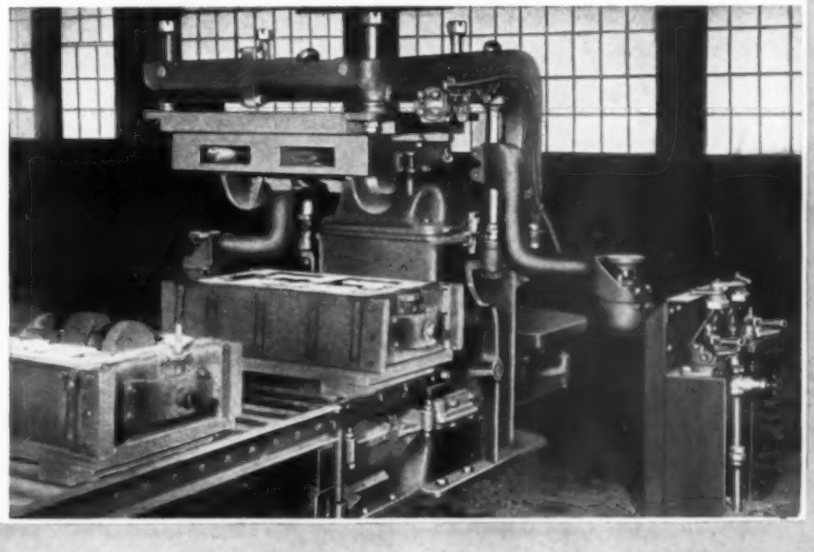
No. 243 Osborn Jolt Rockover Pattern Draw Moulding Machine in a foundry specializing in high quality alloy steel castings.

No. 243 Machine making moulds for intricate valve and pump castings in a gray iron foundry.



TIME PROVES VALUES

OSBORN

ACTIVITIES OF FOUNDRY GROUPS

Chicago

APPROXIMATELY 125 attended the June meeting of the Chicago chapter, American Foundrymen's association, June 13, to hear Dr. H. C. Lorig, research metallurgist, Battelle Memorial institute, Columbus, O., speak on "Gray Iron Metallurgical Practice." Technical chairman of the meeting was H. Kenneth Briggs, Western Foundry Co.

At the request of the chairman, Dr. Lorig first explained some of the purposes of Battelle Memorial institute, giving interesting data on its various divisions, and their manner of operations, as well as explaining the origin and early history of the institute.

Toward the end of Dr. Lorig's discussion, he showed approximately a dozen lantern slides illustrating numerous structures he had mentioned in his talk. At the conclusion of the address, considerable discussion was held as members in attendance requested further information or mentioned salient points in connection with their experiences and procedures similar to those outlined by the speaker.

Officers and directors of the chapter were elected as follows: Chairman, L. H. Rudesill, Griffin Wheel Co.; vice chairman, C. E. Westover, Burnside Steel Foundry Co.; secretary, L. L. Henkel, Interlake Iron Corp.; and treasurer, C. C. Kawin, Chas. C. Kawin Co. Directors are H. Kenneth Briggs, Western Foundry Co.; J. J. Fox, Wisconsin Steel Co.; W. C. Packard, National Engineering Co.; G. P. Phillips, International Harvester Co.; A. W. Weston, Chicago Hardware Foundry Co.; and H. W. Johnson, Greenlee Foundry Co.

Plans are being drawn up now for the chapter's annual golf party which is scheduled to be held Sept. 24 at Lincolnshire country club,

(*Continued on page* 47)

Third annual outing of the Northeastern Ohio chapter was held at Lake Forest, Hudson, O., June 25

WINS FIRST PLACE WITH MOTOR MAKERS
UNIFORMITY EARNS PREFERENCE FOR PENOLYN CORE OIL
SELECTED BY OVER 80% IN DETROIT AREA

AUTOMOBILE manufacturers are among the most critical buyers in American industry. That is why their swing to Penolyn is so significant. Used by over 80% in the Detroit area, Penolyn Core Oil won first place after repeated tests.

These tests proved more than the usual claims of binding more sand, minimum baking time and ready decomposition during casting. Time after time, the automotive foundries found they secured identical results. They found Penolyn has absolute uniformity, assuring close control, allowing standardized practice, insuring perfect castings.

This uniformity has been observed throughout the foundry industry where Penolyn is relied on for speed and economy through fewer rejects and better castings. For real economy, try Penolyn. Let Penolyn prove to you why it is first choice of critical buyers.

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(*Continued from page* 44)

Crete, Ill. John H. Abbott, Hickman, Williams & Co., is general chairman of the entertainment committee, while P. V. Martin, Carnegie-Illinois Steel Corp., is chairman in charge of arrangements for the golf party, complete details of which are to be announced at a later date.

In addition to the regular program presented at the meeting, some 20 members also adjourned for a round table nonferrous discussion.—*J. F. Powell.*

Wisconsin

WISCONSIN chapter of the A. F. A. held its regular monthly meeting at the Schroeder hotel, Milwaukee, on June 17 with Walter Gerlinger, Walter Gerlinger Inc., presiding. Approximately 150 members and guests attended the meeting to hear W. F. Piper, Beardsley-Piper Corp., Chicago, who gave an illustrated talk on "Foundries Around the World."

V. J. Hydar, Falk Corp., Milwaukee, chairman of the chapter apprenticeship committee, presented cash awards to winners in local apprenticeship molding and pattern-making contests. After the installation of the following officers: R. M. Jacobs, president; W. J. MacNeill, vice president; B. D. Claffey, secretary; W. J. Donnelly, treasurer; and Harry Donald, Ray Flansburg, and A. F. Genthe, directors, C. E. Hoyt, American Foundrymen's association, Chicago, greeted the new officers on behalf of the entire association—*W. J. MacNeill, vice president.*

Reading

REGULAR meeting of the Reading Foundrymen's association was held at the Wyomissing club, Reading, Pa., June 21. Motion pictures shown by C. F. Wolf and C. W. Thompson, New Jersey Silica Sand Co., Millville, N. J., attracted considerable interest. The pictures showed preparation of the various types of foundry molding sands and cupola clays supplied to the foundry field by the firm.

The first annual picnic and golf tournament of the Reading group was held at the Manor Country club, Fritztown, Pa., on June 25. The affair was a huge success, and was attended by visitors from Philadelphia, New York, Chicago, Pittsburgh, and other eastern cities. Success of the picnic was due largely to efforts of Chairman H. P. Good, Textile Machine Works, Reading.

A kicker's tournament was held and first prize for low gross with a score of 71 was won by J. Ciabattoni, Reading Steel Castings Co. Other golf prizes were won by R. H. Clymer, Luria Brothers Inc.; Frank Martin, Spencer Co.; George Heister; H. G. Henry, York Motor Express Co.; Nels Dreher, Reading Foundry & Supply Co. Myron E. Painter, Jos. Painter & Sons, Myerstown, Pa., won first prize in the chicken judging contest.

President Julian B. Greenstreet, Textile Machine Works, made an interesting contribution to the floor show by giving a monologue entitled, "Nobody Loves a Fat Man."—*H. C. Cummings, secretary.*

Buffalo

CLOSING meeting of the season was held by the Buffalo chapter of the A. F. A. on June 20 with 82 present. Following the dinner, the annual election of officers was held, and the follow-

Golf, a ball game between foundrymen and vendors, and a dinner featured the Northeastern Ohio outing

ing will serve for the coming year:

Chairman M. W. Pohlman, Pohlman Foundry Co.; vice chairman W. J. Corbett, Atlas Steel Casting Co.; secretary J. R. Wark, Queen City Sand & Supply Co.; treasurer R. K. Glass, Republic Steel Corp.; directors J. P. Begley, Pratt & Letchworth Co.; T. H. Burke, Otis Elevator Co.; Lynn Reynolds, Worthington Pump & Machinery Corp.; Arthur Lockwood, Lumen Bearing Co.; V. Mazurie, Buffalo Foundry & Machine Co.; Ralph Rycroft, Jewell Alloy & Malleable Co. Inc., and W. S. Miller, Charles C. Kawin Co.

Report of the membership committee indicated that over 100 new members had been secured during the past year. Following the business session, the members enjoyed a floor show, and refreshments donated by Bob Molley, Foundry Metal Sales.—*J. R. Wark, secretary.*

Technical Meeting At Ann Arbor

Second fall technical conference of the A. F. A. will be held in cooperation with the University of Michigan, Ann Arbor, Mich., on Sept. 15, 16 and 17. The Detroit chapter of the A. F. A. also will participate. Committee in charge of the program consists of the following:

Richard Schneidewind, department of engineering research, University of Michigan, chairman; A. L. Boegehold, General Motors Research Laboratory, Detroit, representing A. F. A. gray iron division; F. A. Melmoth, Detroit Steel Casting Co., Detroit, representing steel division of A. F. A.; H. M. Wright, Michigan Malleable Iron Co., Detroit, J. H. Lansing and Enrique Touceda, Malleable Founders' society, Cleveland, representing malleable division of A. F. A.; H. M. St. John, the Crane Co., Chicago, and E. R. Darby, Federal-Mogul Corp., Detroit, representing nonferrous division of A. F. A., and V. A. Crosby, Climax Molybdenum Co., Detroit, R. G. McElwee, Vanadium Corp. of America, Detroit, and Fred J. Walls, International Nickel Co. Inc., Detroit, representing Detroit chapter.

Sessions of the conference will be held in the Michigan Union building and the tentative program is as follows:

Thursday, Sept. 15

Morning
- Registration.
- Malleable Iron Session.
  - Chairman, Homer Wright, Michigan Malleable Iron Co.
- Discussion—Malleablizing.

Afternoon
- Nonferrous Session.
  - Chairman, E. H. Darby, Federal-Mogul Corp.
- Discussion—Age Hardening.

Friday, Sept. 16

Morning
- Steel Session.
  - Chairman, F. A. Melmoth, Detroit Steel Casting Co.
- Highly Alloyed Heat and Scale Resistant Steel Castings, by James Corfield, Michigan Steel Castings Co., Detroit.
- Cast Steels in Automotive Work, by H. H. McCarroll, Ford Motor Co., Detroit.

Afternoon
- Cast Iron Session.
  - Chairman, V. A. Crosby, Climax Molybdenum Co.
- Transformation Rate of Austenite in Cast Iron, by Prof. W. P. Wood and Dr. D. W. Murphy, University of Michigan.
- Effect of Undercooling on the Nature of the Graphite Pattern in Gray Cast Irons, by C. D. A'mico and R. Schneidewind, University of Michigan.
- Spectograph as a Foundry Tool, by A. M. Sampson, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

Evening
- Conference Dinner.

Saturday, Sept. 17

Morning
- Cast Iron Session.
  - Chairman, A. L. Boegehold, General Motors Research Laboratory, Discussion Leader, J. W. Bolton, Lunkenheimer Co., Cincinnati, O. Assistant Discussion Leaders, R. G. McElwee, Vanadium Corp. of America; Fred J. Walls, International Nickel Co., and V. A. Crosby, Climax Molybdenum Co.
- Some Factors Affecting Properties of Superheated Cast Iron, by Dr. H. C. Lorig, Battelle Memorial Institute, Columbus, O.

Afternoon
- Laboratory Inspections and demonstrations.
- Recreation, golf, swimming, etc.

Book Review

The National Almanac and Yearbook, fabrikoid, 960 pages, published by the National Survey & Sales Corp., Chicago, and supplied by THE FOUNDRY, Cleveland, for $1.10, and in Europe by the Penton Publishing Co. Ltd., London.

Although it is the successor to the *Chicago Daily News* Almanac, this volume is an entirely new publication. It contains the usual statistical material concerning government, business, labor, public health, etc., but, by arranging the contents into 30 carefully outlined chapters and by the introduction of encyclopedic or background material, an interpretive approach has been attempted.

For instance, population figures are accompanied by brief explanations of the significance of population trends; arguments pro and con regarding high and low tariffs are included in the section on foreign trade; the tenets of the principal religions of the world are explained; and there is a complete category of crimes.

To Hold Conference At Iowa City

Third annual foundry conference at the State University of Iowa, Iowa City, Iowa, Oct. 14 and 15, will have the co-operation of the Northern Illinois and Southern Wisconsin chapter of the A. F. A., and the Northern Iowa Foundrymen's association.

Personnel of the committee in charge includes Horace Dean, Deere & Co., Moline, Ill., chairman; Harry Henninger, Farmall works, International Harvester Co., Rock Island, Ill.; T. J. Frank, Frank Foundries, Davenport, Iowa; Prof. H. O. Croft, and A. V. O'Brien, State University of Iowa.

The tentative program follows:

Friday, Oct. 14

9:00 a.m.
- Registration, Engineering building.

9:30 a.m.
- Open meeting.
- Chairman, P. T. Bancroft, Moline, Ill.
- Address of Welcome, by Dean F. M. Dawson, college of engineering.

10:00 a.m.
- Practical Sand Problems and Their Remedies.
- Chairman, H. H. Schmidt, International Harvester Co., Rock Island, Ill.
- Core Room Problems, by L. P. Robinson, Werner G. Smith Co., Cleveland.
- Casting Defects Due to Sand, by H. W. Dietert, Harry W. Dietert Co., Detroit.

2:00 p.m.
- Practical Metal Problems and Their Remedies.
- Nonferrous Chairman, H. E. Alex, Rock Island arsenal, Rock Island, Ill.
- Defects in Nonferrous Castings, by C. V. Nass, Fairbanks-Morse Co., Beloit, Wis.
- Gray Iron Chairman, A. E. Hageboeck, Frank Foundries Inc., Moline, Ill.
- Producing Good Gray Iron, by M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.

6:30 p.m.
- Conference dinner.
- Presiding, H. O. Croft, college of engineering.
- Addresses by H. Bornstein, past president of A.F.A., and director of laboratories, Deere & Co., Moline, Ill., and President Gilmore, State University of Iowa.

Saturday, Oct. 15

8:30 a.m.
- Equipment Problems and Methods.
- Chairman, John H. Ploehn, French & Hecht Inc., Davenport, Iowa.
- Pattern Problems, by J. E. Kolb, Caterpillar Tractor Co., Peoria, Ill.

9:40 a.m.
- Refractories.
- Chairman, J. H. Diedrich, Blackhawk Foundry & Machine Co., Davenport, Iowa.
- Monolithic Linings, by R. E. Wilke, John Deere Tractor Co., Waterloo, Iowa.

10:30 a.m.
- Molding Problems.
- Chairman, Fred Kirby, John Deere Spreader Works, Moline, Ill.
- Molding Equipment, by W. R. Jennings, John Deere Tractor Co., Waterloo, Iowa.

Afternoon
- Recreation—Golf.

for CONDITIONING GREATER QUANTITIES OF Sand -

the new large SCREENARATOR

At the insistence of many foundrymen, we developed and now offer the *new large* SCREENARATOR, the ideal portable sand conditioning unit for foundries having a large facing, backing or core sand requirement.

Not unlike the original SCREENARATOR in design and operation, this new unit does a fast, thorough conditioning job; screening, double-aerating and piling the sand in any desired location. The *large* SCREENARATOR handles up to one ton of sand per minute—depending on mesh of screen.

Over 500 SCREENARATORS are in use today—in jobbing foundries as the sole conditioning unit and in production foundries for serving side floors and bays not tied into the sand system.

They're easily moved about the shop; easy to shovel into because of low screen height; provide simple control of discharge into high or low piles; and require little maintenance or repair. Simply renewed rubber paddles and steel liners and quickly replaceable screens are the only wearing parts; and they're made for long-time service.

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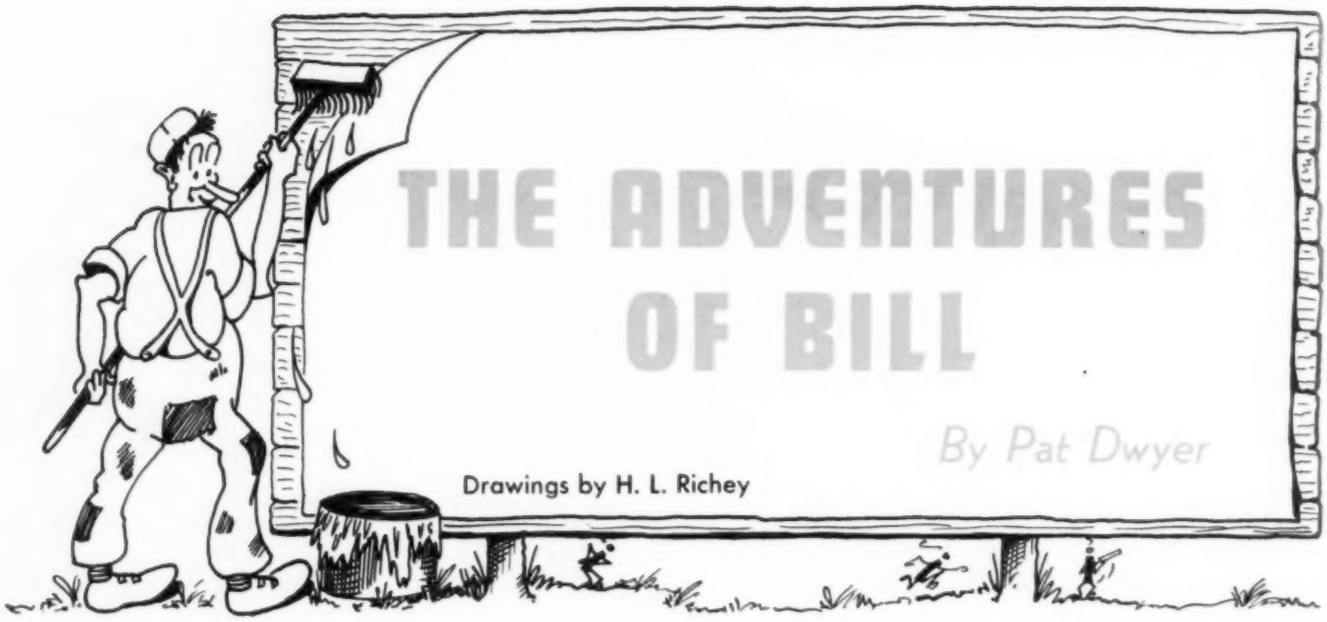
REPRESENTATIVES IN PRINCIPAL FOREIGN COUNTRIES



THE ADVENTURES OF BILL

By Pat Dwyer

Drawings by H. L. Richey

YOU know that book you wrote a couple of years ago," said Bill, "about gates and risers and things. Purry good, purry good as far as it went, but you left a lot of stuff out."

"Indeed?" I remarked coldly, "I was under the impression I had covered the subject in a pretty comprehensive manner. May I ask, pray, what I left out?"

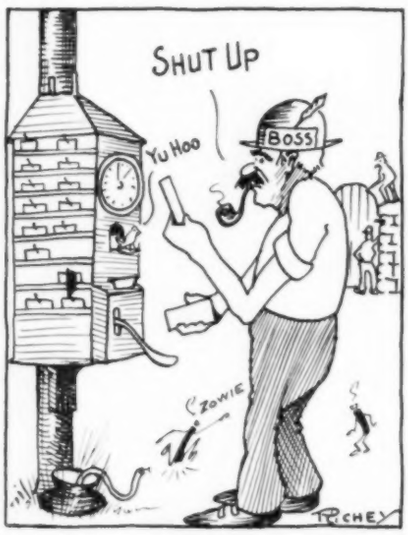
"No need of getting up on your high horse. Personally, I think the book is O. K. but I had a letter today from my old friend Johnny Babbitt and he seems to think that a chapter of historical dope would improve the book no end. Listen:

Dear Bill: Gates, gates, gates, strainers, horns and straights. Such an array, such a display of gates, gates, gates! Just a friendly reference to Pat's valuable treatise on gates. I am sure he will pardon an old timer's flights, flings and fancies. You see I am older than either of you—ha ha—and because of that I can go back farther on the subject of gates.

You will recall the repairing of the walls of Jerusalem by Nehemiah and how he spoke of them as being 'Broken down and the *gates* thereof were consumed by fire? Too many darn runouts I suppose. Anyhow gates entered into and had an important place in his problem.

Names of the various gang foremen are given and I bet when the skipper checked the cards at the time clock, he saw among others the names of Cigaret Jack (Adams), Cast Iron Bill (Carroll), Old Hank (Carhart), Sitting Bull (Overdorf), Pat McNanney, Huey Campbell, Peg Leg Mahoney, The Silica Kid, Payday Tom O'Neil, Big Jim Dalton, Jack Harrington, Bo Lanigan, the three Skellys Martin, Jim and Pat and a host of others who have joined the innumerable caravan which moves to that mysterious realm where each shall take, etc. etc. The realm of happy shop conditions, gobs of draft on patterns and core prints, neat flasks, facing sand and heap sand just right, plenty of gaggers, clamps and weights, etc. Good hot iron, wind on early, go home when poured off and a full day's pay.

But getting back to the subject of gates. The fish gate is mentioned as one Nehemiah had to deal with. Now I suppose a fish gate was used by ancient craftsmen when they were pouring grate castings for salamanders (Amphibia, you know), or when pouring castings where fins were a feature. You know yourself that a big fin is better than a small crush. Also I believe they used malleable iron and steel fish plates on all the railroads. No doubt also they would use a fish gate when pouring castings for scales.



A few vacant chairs day after payday

Do you ask How (e). Sure thing. Also Buffalo, Fairbanks and Toledo!

A sheep gate also is on Nehemiah's list. You will remember Bill that the gate we call a horn gate took its name from the horns of a papa sheep. Quite a number of translators who have 'Diligently compared and reviewed former translations,' declare that, 'the word rendered sheep was seep in the original text and that the letter *H* crept in by reason of a slump in the foundry business, when most foundry men went into the shearing business.' Boy, did they shear! Why a shorn lamb of Wall Street when placed alongside the shorn prices for castings would look like Barnum's fat lady wearing a caracul coat.

The word seep would fit very well in describing the gates employed in pouring castings like telegraph poles on end. A number of small gates 5/16 to ⅜-inch diameter on top—sort of seeping it in, see? And using very hot iron. Hot and slow instead of soft and low. Again, a sheep gate would be used in pouring a hydraulic ram.

Now in violent and radical comparison with the seep gate, which implies hot and slow pouring, let us consider the offal gate, also one of the gates Nehemiah had to repair. Most all molders of long experience at one time or another have worked in shops where this offal gate was the only one that could be used. The only iron they ever got from the Kupe was the kind technically known as B. S. iron. BS, of course as you know being an abbreviation for Burned Scrap. Even though the offal gate was used, the metal in many instances would not run and the molder had to use the old formula: Oh hell, the gate is frozen. Shoot 'er down the riser—with the usual result.

Those were the heats! Start out with a fresh ladle, fresh and green.

(*Continued on page* 53)

(*Continued from page* 50)

and how the Fe_3B would boil and gum up the works. No I don't mean Fe C. I mean Triferrous Bull's Hide, signifying great strength and having the molecular formula Fe_3B. Since this is a binary compound the term used to designate it must terminate with *ide*, therefore the designation Triferrous Bull's Hide is in perfect harmony with the nomenclature of chemistry. Well, anyhow, after about three trips the ladle would have a skull as thick as the skull of any molder who would stay in such a dump more than two pays. To slightly paraphrase the late Bro. Kipling, Card No. 41144:

"What makes the iron come so dull?"
Said Files on parade.
"Ah, 'specs Ah done fo-got de coke,"
The colored charger said.

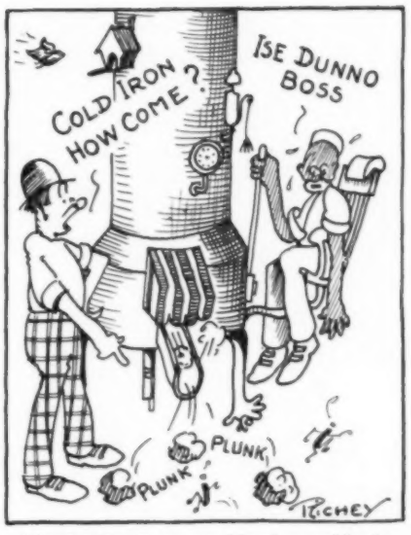
Do you know Bill, I am greatly pleased with my newly coined term Triferrous Bull's Hide. I hope future writers graciously will accord me proper credit when they have occasion to use it.

One never can tell how far he will be carried into the realms of both pure and applied science when on a subject like this.

I might refer to many other types of gates, but I shall leave the rest of them to you to develop. Then you know we have gates all around us. What about the 'Gates of Hercules, sail on and on,' and, 'The beautiful gates ajar.'

Now Bill, don't forget that there were craftsmen in those days. Foundrymen who could do things. Take a gander back to the days of the building of King Solomon's temple. It appears that all the boys in Local No. 1 were green sand men, stoveplate, light machinery and all that kind of stuff. So Solomon calls up his father's old friend Hiram of Tyre to see about borrowing a bunch of his loam molders. Hiram, president of the Tyre & Sidon Shipbuilding and Dry Dock Co., says 'Sure. Glad of the chance to place the boys for a few months.' He was practically shut down. Dickering with the government for three triremes, but what with politics and one thing and another, he didn't expect to get going on them until the fall. He also sent his master mechanic, by all accounts one of the greatest all around lads that ever lived, a master molder.

All this was about 500 years before Nehemiah comes in to rebuild the walls and repair the gates, or about 1005 B. C. so you can see for yourself or tell any nosey inquirer that our craft is a pretty old one. If any person cares to read an account of the building of the temple as recorded in the First Book of Kings; also in Second Chronicles II, III and IV, he will find that the brass castings made under this man's supervision were so many and so heavy that the weight of them never was found out or recorded. Second Chronicles IV, 18. First Kings, VII, 47. In a preceding verse he will read that the castings were made in the valley of the Jordan, in the clay ground between Succoth and Zarthan or Zendah in another spelling. Regular Milville gravel, eh? Now among all these castings two were mentioned especially. These were the pillars which stood at either side of the porch of the temple, Jachin on the right side and Boaz on the left side. Second Chronicles, III, 17.



Maybe the fan was blowing cold air

By consulting First Kings, VII, 15, you will find that the dimensions of each pillar are given as 18 cubits high and a line of 12 cubits, 'did compass either of them about.' (Circumference to you, Bill). Now in case you have forgotten all you ever learned in Sunday school—and that was no great burden to carry around—a cubit is equal to our measurement of 18 inches or 1½ feet. And if I wanted to show off I could give it to you in centimeters 45.72 and how do you like that? Well, any way the pillars were 27 feet high and approximately 6 feet outside diameter. Where do I get the 6 feet? Why, by the good old foundry rule of taking one third of the circumference, in this case 12 cubits, or 18 feet. Elementary stuff, my dear Watson, elementary. Let me have the fiddle old boy and I'll fiddle you out a few more figures.

Assuming a 5-inch wall thickness we would have an inside diameter of 62 inches. Under present day conditions the thickness probably would be held to 1.2536 inches with a penalty for plus or minus three thousandths of an inch. The old boys were more tolerant and less stingy in all their activities. Look at Solomon with a brand new wife for every day in the year—count 'em, 365—and three times that many spares packed away in a store room around the corner. Do you think a man like that would haggle over the weight of a casting? Not likely. He probably said, "Use your own judgement, boys and send me the bill."

Well, now just for curiosity let's see what was the weight of one of these columns. Taking the dimensions given and assuming a 5-inch thickness we arrive at a total of 340,848 cubic inches. Multiplying this by 0.30, the weight of a cubic inch of brass, we are astonished to find that the casting weighed 102,254 pounds, or a little over 50 tons. Any way you look at it, 50 tons is a lot of brass and mind you there were two of these castings. In addition the foundrymen also made 10 big basins about 10 feet in diameter and an hand's breath or 4 inches in thickness, besides a lot of miscellaneous stuff which would bring the total metal requirement up to 400 or 500 tons. Suppose the column was not 5 inches thick. Suppose it was 1, 2, 3 or 4 inches thick, the weight still is impressive: Approximately 10 tons for the 1-inch, 21 tons for the 2-inch, 31 tons for the 3-inch and 42 tons for the 4-inch thick casting.

How do you suppose they melted and poured the metal? Even Benvenuto Cellini in his most boastful moments—and he had plenty of them—never touched the records hung up by Hiram the Bold and his merry men.

Returning for the moment to the sheep gate and the reference made to shearing, you will recall that in the processes employed in bringing the fleece as shorn from the back of the sheep to the finished wool ready for spinning and weaving there is or was a process known as

(*Concluded on page* 98)

Looks as if the old boy could have gone further and fared better

VIEWING Foundry Developments AT SHORT RANGE

RECURRING leakage under pressure in some types of nonferrous castings may be due to shrinkage or pouring at too high a temperature. If shrinkage is the cause, the leakage usually occurs in the same place, and change of gating to permit proper feeding will remedy the trouble. Pouring too hot usually is indicated by leakage throughout, and a general discoloration of the structure.

* * *

It is said that soft soldering on chromium and high chromium alloys can be accomplished by a cathodic polarization process. The metal is placed in a bath containing 240 grams of nickel sulphate and 50 grams of sulphuric acid per liter for 5 minutes at a current density of 150 amperes per square foot. The bath is operated at 35 degrees Cent. (95 degrees Fahr.). For soldering a zinc chloride flux is used.

* * *

CASTINGS which are to be porcelain enameled should be removed from the sand as soon as they are sufficiently cooled, because those which are allowed to remain buried or partly buried in the sand overnight will blister.

* * *

Nickel-vanadium cast steel is used widely in transportation and heavy machinery industries where high strength with minimum weight must be obtained. Typical analysis shows the following: Carbon, 0.25 to 0.35 per cent; manganese, 0.85 to 1.10 per cent; silicon, 0.25 to 0.50 per cent; nickel, 1.25 to 1.75 per cent; sulphur and phosphorus maximum, 0.05 per cent, and vanadium 0.08 to 0.12 per cent. Minimum tensile properties for normalized and tempered product are: Yield point, 60,000 pounds per square inch; tensile strength, 90,000 pounds per square inch; elongation in 2 inches, 25 per cent, and reduction of area, 50 per cent.

* * *

LEAD segregation in 5 per cent tin bronze containing 20 to 50 per cent lead is inhibited by the addition of nickel according to an investigation carried out in Belgium. Addition of 0.83 per cent nickel is effective for 30 per cent lead while 3.65 per cent nickel will hold in 45 per cent lead.

* * *

A recent patent describes a new core binder which is composed of equal parts of unextracted soybean meal or flour and gasoline-insoluble pinewood resin ground together. It is used in the ratio of 55 parts of sand to 1 of compound, and is said to bake fast and have good properties. Such a mixture baked for 1.5 hours at 425 degrees Fahr. is reported to have given a tensile strength of 177 pounds which, after standing in a moisture saturated atmosphere overnight, showed a tensile strength of 165 pounds.

* * *

A high alloy iron containing 4.5 per cent nickel, 1.5 per cent chromium, and 1.5 per cent molybdenum is claimed to be used successfully for cast valve seat inserts for automotive applications.

* * *

According to a recent German patent for a process of manufacturing high quality cast iron, a fine-grain product with finely flaked graphite and high density is obtained by adding zinc, sodium, potassium or lithium prior to pouring. The amount used is less than 0.5 per cent, and generally less than 0.25 per cent. In addition less than 0.5 per cent of arsenic, aluminum, magnesium, calcium or barium are employed.

* * *

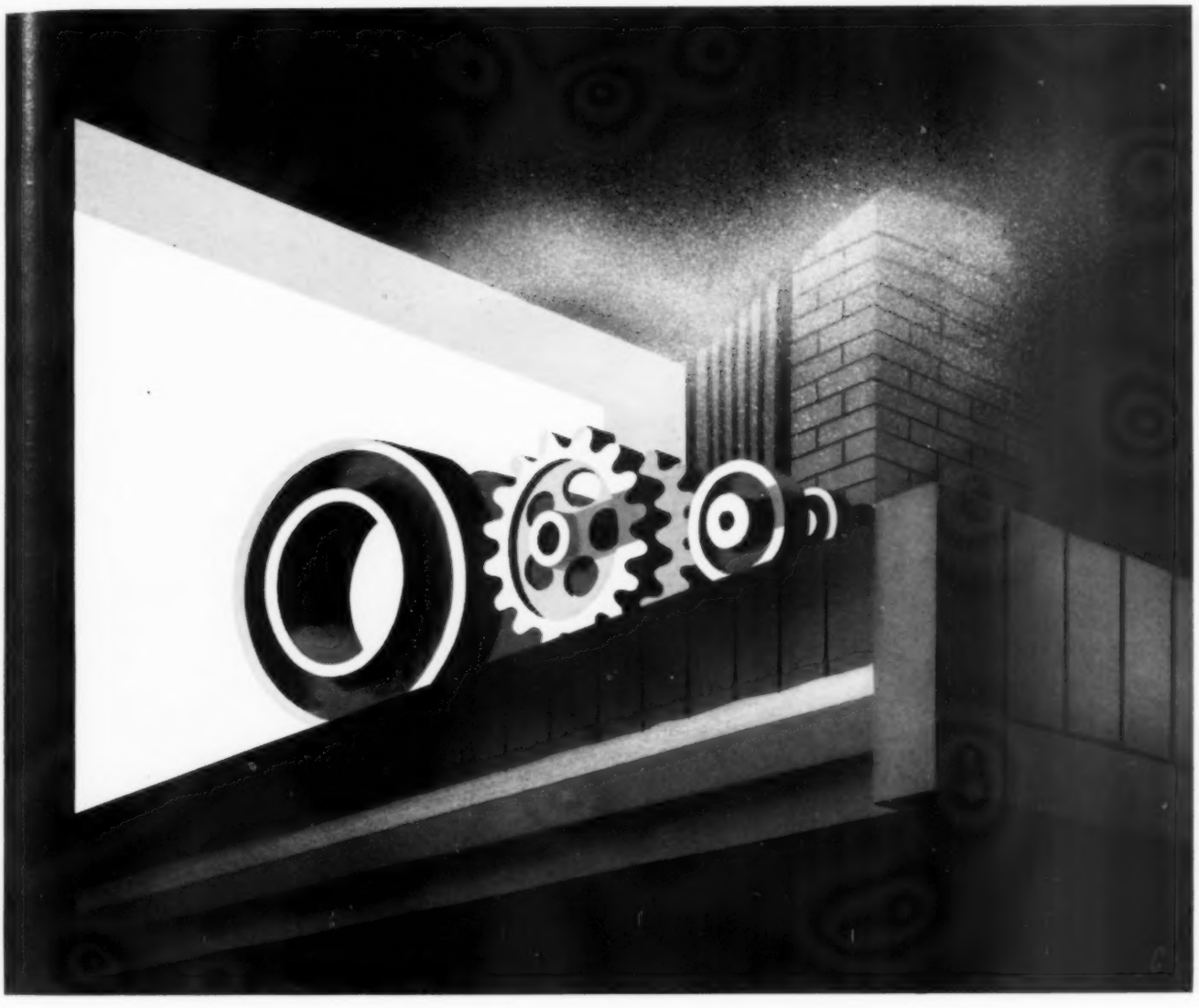
Black nickel plating which commonly is employed on the background of aluminum name plates may be applied directly by using a bath comprised of nickel ammonium sulphate, 8 ounces per gallon; zinc sulphate, 1 ounce per gallon, and sodium sulphocyanate, 2 ounces per gallon. Nickel anodes are used with a voltage of 1 and a current density of 1 to 2 amperes per square foot.

* * *

SURFACE of iron and steel can be made to contain a high percentage of manganese, according to a patented process. Its particular application is to malleable cast iron wherein the hard iron is packed in ferromanganese, manganese ore or manganese metal and salt, and heated at 1600 to 2000 degrees Fahr. During the heating period regular malleablization occurs, but in addition the surface is impregnated with manganese which is alloyed with the iron.

* * *

Fire pots produced in the foundry of a well known manufacturer of hot-air type residential furnaces carry a 20-year unconditional guarantee. They contain 1 per cent chormium and 1 per cent nickel which is added without any change in the regular base mixture previously employed.



MINIMIZING MASS EFFECT

MANY manufacturers in different lines are profiting from the versatility of Moly steels. In one instance a single cast steel (Chrome-Manganese-Moly) is used for a variety of applications — to the benefit of both manufacturer and users.

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MOLY

A Practical Approach To Marketing Gray Cast Iron

By W. W. ROSE

Executive Vice President
Gray Iron Founders' Society, Cleveland

IT is axiomatic that no manufacturing plant can continue in business unless it is able to market its product at as much or more than what it cost to place it in the customer's hands.

What is ordinarily known as *specialty* selling consists in finding prospects, converting prospects into wanters and then persuading the wanter that what is offered is of more value to him than the money in his pocket.

Selling castings differs somewhat from that procedure.

While there do exist complete specialties in gray iron such as sash weights for builders, manhole covers and rings for municipalities, etc. the most general market lies with the manufacturer of a finished product. The latter has to make his product from a material or, more often, from many materials. He will select that which will give satisfactory service at a minium cost, but he must have material parts. The foundry must meet these conditions in order to sell.

Gray iron is one of the oldest basic materials known to man and one of the most widely used. Due to intelligent research in both methods of production and composition extraordinary advances have been made in its qualities since the World war. One does not have to consult any hoary manuals to realize the improvement. The American Foundrymen's association, the American Society for Testing Materials and other technically minded groups have fostered these advances and contributed greatly to the accomplishments of the foundry industry.

Unfortunately the foundryman has been so wrapped up in the production end of his business that the method of disposal of his product has lagged far behind. Sales methods and facilities have failed to keep pace with improvements in product. When cast iron was cast iron it was sold universally by the pound. This obtains to a great extent today and while new processes and the infinite combinations with other elements now present a tremendously wide range of charcteristics, many foundrymen have failed to take advantage of the sales opportunities thus presented.

The younger materials of engineering such as plastics and welding, have not been slow to take advantage of this situation. Having but short histories they had little ossification to overcome and sprang into the market with heavy emphasis on their products' performance couched in terms readily understood by their customer.

Should Come Out in the Open

Why should the customer not regard gray iron as a base material? Except for the splendid work of some purveyors of alloying elements, a licensed group of producers of a proprietory iron and a handful of progressive individuals, the gray iron foundryman has buried himself in his foundry, shunned publicity, growled about his price-cutting neighbors, insisted that the industry was purely local and held on like grim death to the patterns of his old customers.

The result has been that the progressives are getting a better price and can face a situation like the present without keeping a foundry Daniel Boone on top of the cupola stack, shotgun in hand and a weather eye open for the sheriff.

Do we exaggerate? "Let's examine the record!"

The National Association of Purchasing Agents in their 1938 *Handbook of Commodity Data Sheets* describe cast iron as follows: "It is brittle and not capable of withstanding shocks, but its advantages are cheapness, ease of molding into intricate shapes, and ease of machining."

An important steel company recently ordered a large gear housing to be made of welded steel by a company which also operates a gray iron foundry. It insisted on steel until shown the damping advantage of the casting by actual physical comparison. It was absolutely unaware of the difference before.

The Gray Iron Founders' Society is constantly being importuned for physical data on gray iron. The public is unaware of it.

From the foregoing it is hardly subject to challenge that something is needed, something should be done. The Gray Iron Founders society recently has begun a program to correct the situation.

While there is much engineering data on gray iron in existence which would be of invaluable use in sales promotion, at present it is scattered through the professional literature of many countries. It must be collected, weighed as to reliability and so tabulated as to be as readily available to the intelligent salesman as insurance tables are to the insurance agent. Once this initial task has been accomplished what remains to be done will stick out like a sore thumb and invite the attention of industrial research.

So equipped, the foundry salesman then may make his prospective customer aware of the selection of suitable irons available to him. The designer will have his eyes so opened to the wide range of castings at his disposal that it cannot fail to retrieve tonnage now lost and clearly demonstrate the advisability of thorough investigation of the possibilities of gray iron.

Alive to the widely differing opinions of gray iron castings producers, the Gray Iron Founders' society has entrusted the selection of engineering data to a research institution of international standing. The results it produces should be above criticism. Members of the Society can expect concrete results within 6 or 7 months and in due course it should toll the knell of price cutting sales. The purchasing agent or designer will not be slow to recognize the necessity for paying a fair price if he has reasonable assurance that he will get what he needs and specifies.

There is but one "if" in the program. The society undertaking this colossal task is small and struggling. Will the many units comprising the gray iron industry recognize what this work will mean to their sales and join in supporting and extending it into the more distant though closely following field of physical research?

Casting Bath Tubs and Sinks In Permanent Molds

OVER a period of many years progressive and inventively minded foundrymen have experimented with permanent molds. Permanent in this instance does not necessarily mean a mold that will last forever, but one in which a reasonable number of duplicate castings may be made before it is rendered useless or obsolete. A comprehensive review of the development of the centrifugal casting process in which metal molds are employed extensively was presented by J. D. Capron in the July 15, 1927 issue of THE FOUNDRY. Articles describing plants in which the centrifugal method is practiced have appeared in THE FOUNDRY on many occasions during the past decade.

Inventors of permanent molds have worked along three main lines. In one, the two-part mold is made up of two solid blocks of iron, each half containing half of the desired mold cavity. One half remains stationary, while the second half is moved back and forth through suitable mechanism. Metal is poured into the mold while the two halves are in contact. After the metal has solidified, the second half of the mold is drawn back a certain distance and the casting is removed. This type of mold is based on the principle that the heat from the casting is diffused through the mass of the mold to such an extent that distortion or over heating of the mold does not take place. About 20 years ago Edgar A. Custer, Tacony, Pa., aroused a great deal of interest in foundry circles by extended application of this method. Incidentally, Mr. Custer dwells on this work in his recent book, *No Royal Road*. This type of mold still is employed in several western foundries specializing in the production of hard iron balls for grinding mills.

In a second method, attempt has been made to regulate the temperature of cast iron mold, by providing a hollow mold in which water is circulated while the mold is in service. In a later development of that type, oil was substituted for water. Extended reference to the development, construction and application of that type of mold by H. A. Schwartz, appeared in the Oct. 1, 1925, and the Jan. 15, Feb. 1, Feb. 15, and March 1, 1926 issues of THE FOUNDRY.

In a third method, temperature of the mold is controlled by a form of construction which promotes maximum radiation on the outside face of the mold. Ribs, fins and other projecting members are provided for that purpose. The molds may be worked as individual units, but in the majority of instances a number of the molds are mounted on a turntable. As the turntable revolves, the molds automatically are closed and opened to receive the molten metal and discharge the resulting castings.

At the convention and exhibition of the American Foundrymen's association held in Milwaukee, Matthew Wagner, Glendale, Calif.,

demonstrated a permanent mold which he has designed and constructed for the production of sinks, bath tubs and other castings of a somewhat similar character. It is claimed that experimental work over a period of several years has shown that these castings, larger than any heretofore attempted in permanent molds, can be produced successfully.

In this instance the mold is maintained at working temperature by oil circulated through coils in the mold. The mold is made up of three parts, a base, a core member for forming the inside of the casting, and a top or cope part for forming the outside of the casting. The core member fits in a recess in the base and is attached to a shaft and hand wheel by which it is raised and lowered. When in raised position, the cope is closed down over it as in ordinary practice. After the metal is poured and the casting has set, the core is lowered a short distance to free it from the casting and thereby prevent the casting from cracking. The cope attached to a small hoist then is lifted and the casting is removed.

A dry sand core, pierced with any desired number of small pop gates, fits in a recess of the cope or top member of the mold. Metal is poured into a suitable pouring basin on top of the core and is distributed rapidly and uniformly through the multiplicity of small pop gates. A great number of small openings on the various joints serve as vents for escape of air.

Shows How To Prevent Accidents

THE booth of the American Foundrymen's association at the recent convention in Cleveland, and shown in the accompanying illustration emphasized the importance of safety, sanitation, hygiene and good housekeeping in the foundry industry. The board at the left was supplied by the Campbell, Wyant & Cannon Co., Muskegon, Mich., and first was displayed during an open house day at the plant when approximately 7000 people, employes and their families and friends visited the plant. The board was set up at the entrance and attracted an unusual degree of attention.

Most of the items illustrated either the cause or the method of preventing accidents. The company prepares most of its own posters. As a result of a good safety program the Campbell, Wyant & Cannon Co., was awarded second place in statewide 1937 foundry safety contest of the Michigan Liability Insurance Co. The management of the plant is thoroughly sold on the importance of a safety program and demands perfect co-operation from all men in a supervisory capacity.

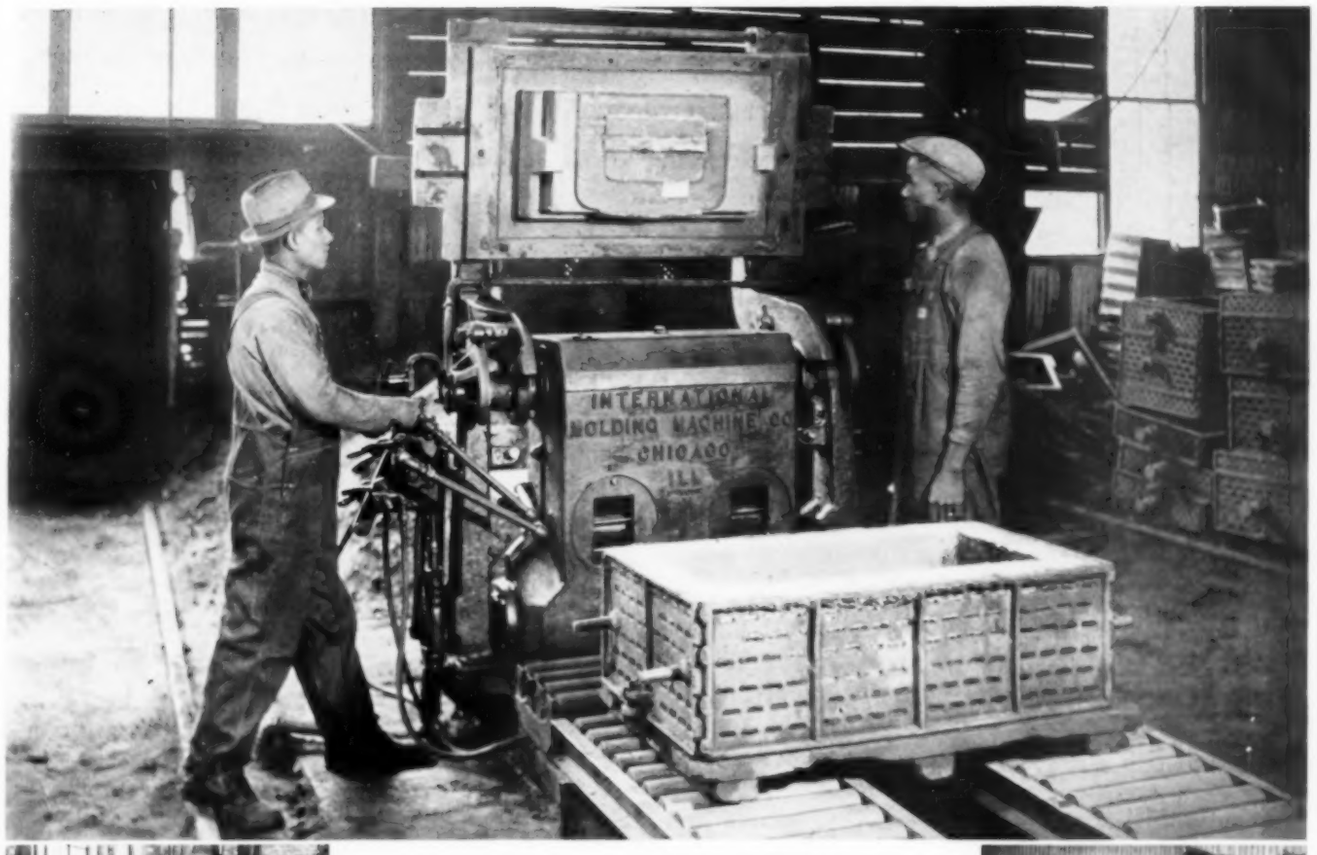
Shown in the center, the bulletin board designed and built by the Belle City Malleable Iron Co., Racine, Wis., occupies a place at the main entrance to the plant. The board is equipped with two clocks, also with red and white lights behind the names of the various departments in the two plants operated by the company, Belle City Malleable Iron Co., and Racine Steel Casting Co. The white light burns during a no lost time accident period. A red light indicates lost time due to accident. On the clocks, one hand shows the number of accidents and the other the amount of lost time. The frame in the center is for posters made by the company's artist, who illustrates the text with a picture showing how the accident happened.

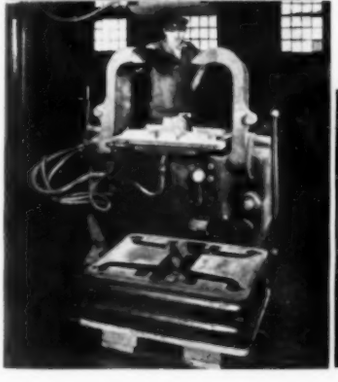
The third panel reading from left to right in the usual manner, under the heading "It Can Be Done", shows pictures of good housekeeping in various plants including Sloan Valve Co., Chicago; Falk Co., Milwaukee; Belle City Malleable Iron Co., and Racine Steel Casting Co., Racine, Wis.; Sivyer Steel Casting Co., Milwaukee; Liberty Foundry Co., Inc., Milwaukee; Spring City Foundry, Waukesha; Appleton Foundry Co., Milwaukee; General Malleable Co., Waukesha, Wis.; Campbell, Wyant & Cannon Foundry Co., Muskegon; Continental Roll & Steel Foundry Co., East Chicago. A number of views of the United States Pipe & Foundry Co., showed examples of good housekeeping in and around the plant.

Enlarged typical pages, prints and tables from the latest code issued by the American Foundrymen's association, *A.F.A. Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems* were prominently displayed at the extreme right. The booth also had on display various types of safety and protective items of equipment manufactured by the exhibitors.

A new foreman's conference service, based on a series of talking still pictures that dramatize plant and personnel problems and show methods of solving them, is being marketed by MacVeagh & Co., 630 Fifth avenue, New York. It is claimed the service applies to the training of foremen the technique that has been used successfully by numerous manufacturers for training salesmen.

Examples of what the foundry industry is doing to prevent accidents were displayed prominently in the booth of the American Foundrymen's association at the recent convention and exhibition in Cleveland





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65 Standard Types of Machines for castings
14 Standard Types of Machines for cores
including 5 designs of BLOWERS
Many Special Types of machines for work of unusual character

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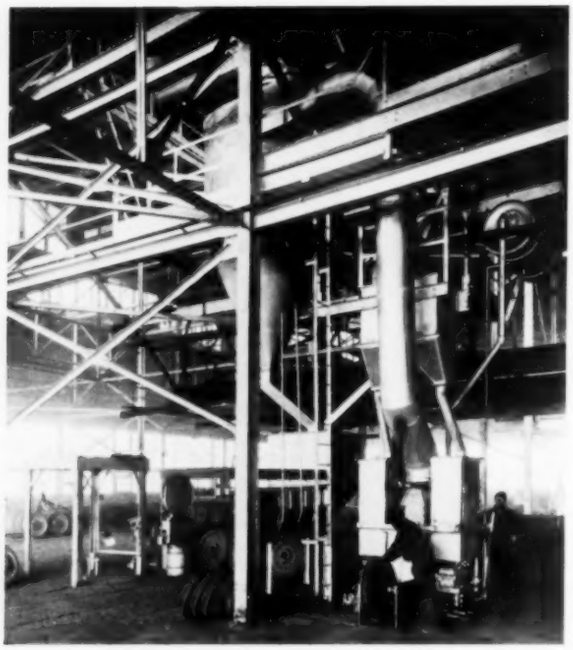


Fig. 6—Each wheel is rolled on edge through a sandblast device which operates on both sides simultaneously

Chilled Car Wheels

(*Concluded from page* 24)

by departments in the general offices Chicago. The superintendent handles all plant operations and manufacturing and reports to the operating manager. The cashier handles all payrolls, purchases, and stock, shipments and billing and reports to the treasurer on all items except purchases which he reports to the general purchasing agent.

Upon the inspector devolves the duty of testing and inspecting the product. He selects the wheels and conducts tests made to insure that the wheel meets all of the requirements for strength and chill set forth in the specifications. The position of the inspector is unique in the respect that he is not employed by nor responsible to the operating officials of the plant. He reports direct to the manager of inspection of the Association of Manufacturers of Chilled Car Wheels and no wheels may be shipped without his approval. The sales agent takes care of all features pertaining to sales and reports to the general sales agent.

Personnel of the general office includes men of long experience. Twenty men in the supervisory force have been with the company for over 30 years. Original standard practice outlining actual duties of department heads was prepared in 1898 and was designed to standardize practice for producing the best results. Changes and additions have been made from time to time to meet changed and improved conditions. The manual is the bible of the Griffin Wheel Co. In 1894 the company designed a bottom pour ladle and has continued to use that type ladle in all plants down to the present. The practice of figuring metal mixtures by chemical analysis instead of metal fracture, was inaugurated by C. H. Vannier, chief engineer in charge of metallurgy for the company in 1887. He opened what is believed to be the first chemical laboratory connected with the foundries in Chicago.

A record of molding and cupola operations was started in 1898. This record covered the wheels poured from each tap of the cupola, chill on the test piece, analysis of the iron, actual weight and tape size of each wheel. Later the record was extended to include temperature of the iron, shakeout time of the casting and temperature at which the wheel was annealed. Through this record the history of any wheel made by the company can be ascertained.

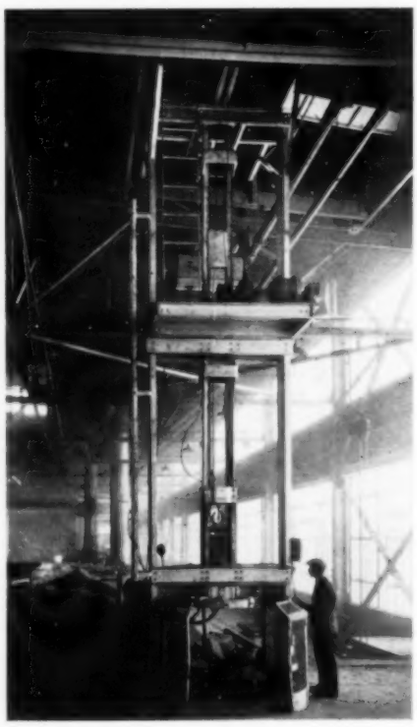


Fig. 7—In the drop test the wheel is subjected to a number of blows from a falling weight

As far back as 1910 the Griffin Wheel Co. obtained a patent covering the use of chromium for increasing the depth of chill when used in treating iron in the small ladles. On account of the increase in sulphur content due to repeated remelting of old wheels after the war, the Griffin Wheel Co. in 1923 developed and used soda ash as a desulphurizing agent. In the same year the company installed a cupola blast preheater in the Chicago plant. It did not prove satisfactory, but led to extensive experiments culminating in the present type preheater, an integral part of all cupola installations in plants operated by the company, and in wheel foundries and in many gray iron foundries operated by other interests.

The latest type heater raises the temperature of the blast to over 600 degrees Fahr. before it enters the cupola. It is claimed that a saving of more than 25 per cent is effected in the fuel and more uniform cupola operation is obtained. The lip type chiller, which extended the lip around the edge of the rim, was developed in 1910 when there was considerable trouble with broken and chipped rims. This changed the direction of the grain of the iron and mitigated rim chipping.

The first attempt to mold car wheels mechanically was made in 1899. The attempt was not successful. Experiments again were resumed in the Denver and Los Angeles plants in 1917. In 1920 a small unit was installed in the Kansas City plant capable of producing 300 wheels per day. The Council Bluffs plant built in 1921 was the first plant designed, built and equipped for mechanical operation both in the foundry proper and in the yard where the charges were made up and later discharged into the cupola. As a result of the successful operation of Council Bluffs plant, other plants were converted from manual to mechanical operation.

In 1924 a skip hoist arrangement was installed at the Detroit plant for conveying the charges of coke and raw material from the yard to the cupola. With this arrangement, one man can charge up to 30 tons of material an hour into the cupola. Since that time, skip hoist chargers have been installed in the Boston, Cleveland, Cincinnati, Chicago, St. Paul and Salt Lake plants.

In 1934 a modern air furnace having a capacity of 25 tons per hour in a duplexing process was installed in the Chicago plant to experiment with predetermined quantities of reduced carbon in the manufacture of car wheels.

This is the first of three articles on the Griffin Wheel Co. The second will appear in an early issue.

THE EDITORS

How Is Business?

(*Concluded from page 25*)

business will be a little better, 16 per cent say much better. Again the Middle-west seems to be more optimistic since a greater number feel that business will be better. However, it may be deduced from the fact that 11 per cent are uncertain, that the outlook for the Fall months is based to some extent on the intangible elements of hope and better feeling which prevailed in July.

A fewer number of foundries reported low inventories of raw materials and supplies than might have been expected, 25 per cent to be exact. However, it should be noted in Table III that 37 per cent state that their inventories are only fair which leaves somewhat more than one-third of the foundries with ample inventories. It will be noted in that table that inventories are more "ample" in the Middle-west and less so in the East which is probably a reflection of the attitude in these two sections toward prospects for immediate foundry business.

Because many foundries study their production facilities when business is less active it seemed worthwhile to check that point in an effort to ascertain how extensive this is being done at the present time. Nearly one-half of the foundries in both sections indicated that they are considering to some extent the application of new equipment for purchase when business warrants, while 19 per cent say they are doing this to a considerable extent. Again, it appears that a definite pick-up may be looked for in the Middle-west prior to the East if the activity in respect to the purchase of new equipment is any indication since 26 per cent of foundries in the Middle-west are studying equipment to a considerable extent as against 12 per cent in the East. Plans for new equipment are shown in Table IV.

Scattered returns from foundries in five southern states received just before press time indicate an average operation of 50.9 per cent of capacity, 3.75 working days a week. The combined sentiment of those reporting shows 69 per cent of the opinion that their business will be a little better in August, while 25 per cent say it will be the same, and 6 per cent say "worse." For September and early fall, 44 per cent expect business to be a little better, 31 per cent much better, and 25 per cent are uncertain. Inventories are stated to be: low, 13 per cent; fair, 27 per cent, ample 60 per cent. In the matter of new equipment, 31 per cent say they are investigating the matter considerably, 44 per cent to some extent, and 25 per cent very little. Comments include: "We do not expect a boom in our business over the balance of the year but are making our plans based on a substantial improvement in 1939." One foundry says, "Future is very bright," while another counters with, "We are operating at zero capacity, believe August will be worse, and September uncertain. Our business is highly seasonal and the use of gray iron castings is declining." Says still another, "We expect in November better business than we have ever had. Inquiries are getting better each week." The foregoing has not been included in the main summary, however, because the returns are not complete enough to give a true statistical sampling for this section, and probably do not give a true picture for the southern states as a whole.

Table V

State	Average capacity of operation per cent	Number of working days weekly
Michigan	42.1	3.50
Ohio	45.0	3.90
Illinois	42.7	3.73
Indiana	43.0	3.70
Missouri	49.3	3.64
Wisconsin	40.5	4.00
Average for Middle West	43.77	3.75
New Jersey	60.8	4.00
New York	36.5	3.30
Pennsylvania	49.3	3.80
Massachusetts	35.3	3.12
Connecticut	38.4	3.20
Average for East	44.06	3.48
Combined averages of East and Middle West	43.91	3.61

General Comments Interesting

In spite of "overtures to business" on the part of the Administration, an undercurrent of unrest over taxation, labor problems, burdensome legislation apparently still play their part as problems which many in the foundry industry feel they must face, and which, specifically, are obstacles to an immediate, extended period of profitable operation.

That business in the Fall may take the form of an "onrush" is indicated by one foundry which says, "Our foundry has a good amount of business on the books which has been held up and deferred into 1939. I feel that with an upturn in business, this load will be brought forward, thereby giving us a load from a static basis."

Pertinent is this observation, "While I have predicted business will be a little better, I refer only to volume and employment. Our selling prices have fallen so that even with a larger volume, we could not make money."

Looking forward to 1939, one foundry states: "Will be 10% to 15% better than 1938. Must develop *new* uses for iron products, new types of metal."

On the subject of new equipment, another foundry (medium size) says: "We have spent $150,000 in new equipment during the past two years, and it is our opinion that foundries must be modernized or go out of business."

Business Better Regardless

As one foundry puts it, "Inventories of finished products have been decreased considerably during the past year. With no better business than we have had will have to work more hours soon. Our foundry is operated as one department of the plant."

Another foundry, operating presently five days a week at 70% capacity, says,". . . . looks the best in five years." And still another . . . . "we have nothing definite to depend upon, just planning from one week to the next." Or, as one foundry puts it: "Orders are increasing. Our prospects tell us ot keep in touch with them every 10 days."

Book Review

Man, Bread and Destiny, by C. C. Furnas and S. M. Furnas, cloth, 364 pages, published by Reynal & Hitchcock, Inc., New York, and supplied by THE FOUNDRY, Cleveland, for $3.00.

The part that food has played through the ages in the development of the human race, and its place in the daily life of everyone, is the subject of this interesting book prepared jointly by the author of *The Next Hundred Years* and his wife, for years an instructor in nutrition at the University of Minnesota. The book is interestingly written and since the relation of proper nutrition to the efficiency of industrial workers is so important, it offers considerable food for thought to executives in industry.

Safety Standards

National Conservation Bureau of the Association of Casualty and Surety Executives, 60 John street, New York, recently has published a revised and expanded edition of the *Handbook of Industrial Safety Standards*. This handbook is a guide for safeguarding working conditions in industrial plants and is based on standard codes for subjects treated in all instances where such codes exist. The handbook may be secured from the bureau for 39 cents per copy.

Among Detroit Foundries

(*Concluded from page* 33)

pressures running up to 375 pounds per square inch, compared with about 85 pounds per square inch on air machines. The change in molding practice also has required a change in sand mixes, since the greater pressure produces a hard, dense wall, and a sand with greater permeability is needed to permit escape of gases from the hot metal. Practically all Ford crankshafts are cast in green sand.

Experimental foundry work at Ford is being carried out on a broad scale and much of it eventually may find its way into production, but the worth of an experimental development must be proved backward and forward before the O.K. is given to transfer it to production. For example, tests are being run on a German-designed cupola in which metal is charged into a vertical stack. The cupola originally was oil fired at the base. A powdered coal fired horizontal hearth has been substituted and good results are reported, with the exception that it is difficult to observe what is going on inside the cupola.

May Change Melting Practice

Some speculation is heard over the possibility Ford may be working toward supplanting electric melting furnaces with a combination of cupolas and holding furnaces. Electrics are used for melting steel for camshafts, crankshafts, pistons, etc. By using a holding furnace of the tilting type and tieing it up with automatic pouring stations, it is possible to make the melting and pouring of iron practically entirely automatic, even to controlling the rate of flow of iron from the holding furnace into the pouring ladle.

At the automatic pouring stations close to the loop of a moving conveyor loaded with molds, a pouring ladle travels at the same speed as the molds and then reverses rapidly back to start pouring the next mold in line.

Referring again to the interchange of parts continually going on in the automotive industry, a good example is found in activities of the Saginaw Malleable Iron division of General Motors. Within the past year or so that division successfully developed pearlitic malleable iron rocker arms, now used on valve-in-head engines. These parts originally were forged, and with the change, one furnace at Saginaw has been in constant production on rocker arm iron. Unusually close control of the melting is practiced. Development of these cast rocker arms has at least partly helped to fill the void caused by a trend toward making differential bell housings of gray iron instead of malleable iron. Chevrolet Gray Iron Foundry, also in Saginaw, is now making some of these housings which are found to be somewhat less expensive than the malleable iron and, by virtue of improvements in gray iron qualities, approximately equal to malleable as far as performance is concerned.

Carrying the changes a step further, when the forge plant was faced with the loss of some rocker arm business, a forged steel wheel hub was developed to supplant the cast hub, especially on heavy-duty vehicles such as trucks and buses. One of the newer fleets of buses is said to be going 100 per cent to forged wheel hubs.

Here, is a complete cycle of evolution—from forgings to malleable to gray iron and back to forgings again. It illustrates the unceasing search for new properties and less expensive production methods which puts the automotive industry in the front rank of advancing foundry techniques.

Incidentally the Saginaw Malleable Iron division has been making a series of tests on pearlitic malleable crankshafts, but there does not appear to be much likelihood of putting them into production for 1939 model engines in the General Motors lines. It is reported a number of these cast shafts were supplied to Packard where they were Tocco-hardened and installed in a portion of the Packard engine output.

The malleable division reopened July 18 after closing June 24. One full shift of 800 men is now operated five days per week. Peak employment is 1200. Chevrolet's gray iron foundry, with peak employment of 5000, was scheduled to close Aug. 1 for a two-week inventory period, after finishing its run of 1938 model parts. It has been operating four days weekly.

A question which probably always will be debated hotly in foundry circles is the captive vs. independent foundry. Does the car builder stand to benefit by operating his own foundry, or should he buy on the outside? There are so many angles to the question, obviously it never can be settled one way or the other.

In periods of slack business, the captive foundry stands to lose because of protracted shutdown periods in which overhead eats up profits. The independent supplier usually can render immediate service in slack times and by bulking the orders from a number of customers often can manage to stay in black ink while the large, captive foundries are idle because the tonnage demand for a few items is not there.

Again there is the danger of the independent foundry placing too much dependence on a single customer and then, after a change in specifications, finding itself without any business. There is the case of a well-known independent foundry here, built some years ago at a cost of well over a million dollars, primarily to supply the needs of one automobile builder. Recently a change was made in the specifications of the part being produced and now the supplier finds his million-dollar plant idle, with not much prospect of early resumption.

Many Captive Foundries

Among the so-called captive foundries in the Detroit district, in addition to the Saginaw and Ford plants already mentioned, are the large Buick foundry in Flint, the Pontiac foundry in Pontiac, the Dodge foundry, the Cadillac foundry and the Packard foundry in Detroit, the Nash foundry in Kenosha, Wis., and the Studebaker foundry in South Bend, Ind. Recently the report has been heard that Nash was looking around for a suitable site to locate a foundry in the Detroit district, but no developments have been forthcoming, although the movement of Nash operations generally has been Detroit-ward.

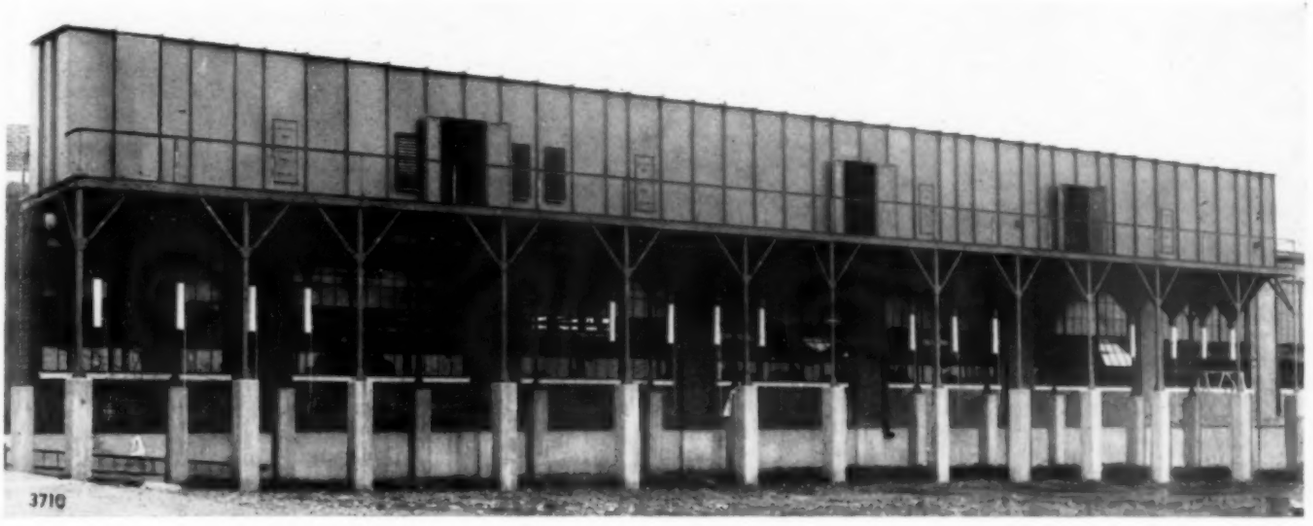
The Pontiac foundry has been idle most of the summer, but has carried forward experimental work looking toward improvement of melting and sand handling practices. It is scheduled to resume production of 1939 model motor blocks around Aug. 23.

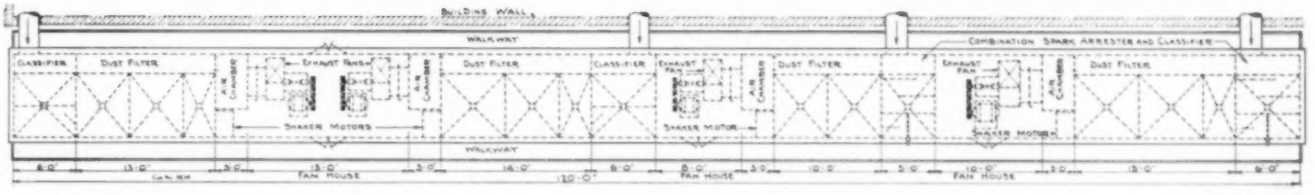
It is understood the Kelsey-Hayes foundry will be in production shortly on a new type of combination pressed steel and cast iron brake drum for use by one of the General Motors divisions.

Federal-Mogul Corp. has developed a solid cast copper cylinder head for installation on Ford V-8 engines, which is reported to show appreciable economies in gasoline consumption. The head has no water jackets and is as thin as 3/16-inch at some sections. Metal is an electric furnace alloy with heat conductivity of 80-85 per cent.

Interest in the new head is reported lively from fleet operators and particularly from state police car fleets. Samples have been installed on police cars in New York, Connecticut, Colorado and some other states, and the New York constabulary is considering installation on 100 cruisers. Cost complete runs around $50 per car.

HUGE SLY DUST FILTER
Makes BIG SAVINGS
for STOVE FOUNDRY





The Problem—

• A new stove foundry in the South required an efficient, flexible exhaust system to collect dust from four groups of cleaning equipment —separately or as a group. The cleaning equipment consisted of 10 double grinders, 2 special grinders, 1 polishing table, 16 tumbling mills, 1 blast table and a blast room to be added at a future date. In addition, the dust control equipment had to be designed to occupy a minimum of space and be economical in installation as well as in operation.

The Solution—

• Sly engineers were summoned. After an extensive survey they recommended the installation of a 120′ dust collecting unit divided into four filtering sections. To conserve plant floor space, they used fan houses between the dust filtering section . . . shaker motors inside of the fan houses . . . air chambers instead of costly transition pieces permitting the use of smaller fan houses and savings on space and equipment.

Moreover, to save on erecting and equipment charges Sly engineers designed the installation to allow the use of stock parts throughout . . . to furnish classifiers which allow only fine dust to reach the filters proper and thus prolong the life of the filter bags . . . to equip the classifiers with spark arrestors to protect the bags against flying sparks from the grinders.

Besides the dust filter, Sly also furnished the fans, motors and drives. The equipment was erected by Sly erecting engineers. It was one of the largest dust collecting systems installed last year.

This same expert engineering service on dust control equipment is available to you, as demonstrated in the case of this large stove foundry. It costs you nothing to find out how much you can save. Ask for Bulletin No. 90.

THE W. W. SLY MANUFACTURING COMPANY

Blast Cleaning Equipment • Tumbling Mills • Dust Control Equipment for Every Industrial Purpose

4700 Train Avenue, Cleveland, Ohio • Branch Offices in Principal Cities

A.S.T.M. Considers Castings

(*Continued from page 27*)

Richart, University of Illinois.

T. G. Delbridge, manager, research and development department, Atlantic Refining Co., Philadelphia, was introduced as the new president to succeed Dr. White. W. M. Barr, chief chemical and metallurgical engineer, Union Pacific railroad, Omaha, Neb., is the new vice president.

Newly elected members of the executive committee are: A. T. Goldbeck, engineering director, National Crushed Stone association, Washington; Dean Harvey, materials engineer, central material and process engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; G. E. Hopkins, technical director, Bigelow-Sanford Carpet Co. Inc., Thompsonville, Conn.; Allen Rogers, supervisor, course in industrial chemical engineering, Pratt institute, Brooklyn, N. Y.; and J. J. Shuman, inspecting engineer, Jones & Laughlin Steel Corp., Pittsburgh.

Torsion Test Valuable Aid

Highlight of the convention was the presentation of the thirteenth Edgar Marburg lecture by Dr. Albert Sauveur, metallurgical engineer and professor emeritus, Harvard university, Cambridge, Mass. The subject of the lecture was "The Torsion Test." Dr. Sauveur pointed out that while the tensile test had been employed for a great many years as a measure of the ability of a material to function in service, engineering materials only infrequently are subjected to tensile stresses. Since the testing method employed should enlighten the user on the properties of metals, Dr. Sauveur believes the torsion test provides the most valuable information. However, strenuous efforts may be required to convince the consuming public that the torsion test is best suited to test the stresses which will be found in service.

Following a description of the torsion testing machine developed to provide the means for making a series of tests, and presenting the data secured on specimens at room temperature, at elevated temperatures and in the blue heat range, Dr. Sauveur presented the following claims for the torsion test: Simplicity of manipulation; low cost of torsion testing machine; low cost of preparing test bars; adaptability for high temperature testing; possibility for reverse testing; possible adaptability for determining creep; possibility of testing at constant speed of twisting or constant speed of loading; and the determination of properties not revealed by the tensile test.

At the same meeting the Charles B. Dudley medal of the association was presented to R. H. Heyer, research department, American Rolling Mill Co., Middletown, O., for his paper "Analysis of the Brinell Hardness Test" which was presented before the 1937 annual convention.

Committee reports and three technical papers were presented at the Thursday evening session on iron, with Dr. Albert E. White, retiring president of the society, and Prof. Herbert F. Moore, University of Illinois, Urbana, Ill., as co-chairman. Report of committee A-3 on cast iron was presented by Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala. The committee report, which was adopted, recommended a tentative revision of standard specifications for gray iron castings for valves, flanges and pipe fittings (A126-30), and the adoption as standard of tentative standard specifications for cast iron culvert pipe (A142-35T), as revised. Activities of several subcommittees were outlined in the report. Subcommittee VI on general castings has appointed a new subgroup to investigate the 2-inch bar in the 60,000 pound class of iron. Subcommittee XIX on chilled and white iron castings, which was organized in March, 1938, will investigate the properties of that class of castings. Subcommittee II on pipe has been disbanded and two new subcommittees, one on soil pipe and one on pressure pipe, are being organized to replace it. The report of committee A-7 on malleable iron castings was presented by Hyman Bornstein, Deere & Co., Moline, Ill. Work of the committee was outlined, but no recommendations were made affecting standards.

Describes White Iron

An important contribution to the literature on chilled iron was presented by S. C. Massari, metallurgist, Association of Manufacturers of Chilled Car Wheels, Chicago, in a paper "Properties and Uses of Chilled Iron." Mr. Massari discussed the basic metallurgy of chilled irons, including the technique of production, heat treatment, effect of various alloys upon chilled iron, and practical application of that material where resistance to wear and deformation under high intensities of pressure are essential requisites. Mr. Bornstein opened the discussion on the paper by emphasizing the use of chilled white iron in the farm implement fields. He pointed out how it had been possible to produce bearings requiring high wear resistance by using a cupola white iron with a carbon content of 3.5 per cent. Dr. White complimented the author upon the paper and placed special emphasis upon the fine technique used in preparing the micrographs.

A written discussion by Ralph S. MacPherran, chief chemist, Allis-Chalmers Mfg. Co., West Allis, Wis., raised the question concerning close cupola control in the manufacture of chilled iron. Mr. Massari stated that the Association of Manufacturers of Chilled Car Wheels now was conducting an investigation which was expected to provide further data on that subject.

A paper "Effect of Size and Type of Specimen on the Torsional Properties of Cast Iron" by Jasper O. Draffin, professor, and W. L. Collins, associate, University of Illinois, Urbana, Ill., and presented by Mr. Collins reported further on a series of tests. A year ago the authors presented data at the A.S.T.M. convention on the tensile strength of cast iron, dealing principally with a means of finding that property accurately. The authors intend to make a series of tests through the entire range of tension, torsion, compression and bending, on the same kind of iron, hoping that it may be possible to correlate the strengths of cast iron under different kinds of stresses.

Tests on Iron and Steel

In the final paper on the program "Note on the Hardness Measurements of Very Hard Steels and White Cast Iron" by J. S. Vanick and J. T. Eash, metallurgists, development and research division, International Nickel Co., Bayonne, N. J. the authors reported the results of an investigation using brinel, scleroscope, Rockwell and Vickers tests on the very hard steels and irons. The authors report that the discord in relationships emphasizes the importance of specifying the type of test which possesses a narrower dispersion from the average of individual tests with other methods, with a tolerance on either side of the average sufficient to encompass the expected spread in values.

Reports of various committees at the session on steel, ferroalloys and corrosion on Thursday morning, revealed a great amount of work in the preparation of specifications and standards. W. M. Barr, chief chemist and metallurgist, Union Pacific Railroad Co., Omaha, Nebr., and O. U. Cook, assistant manager, department of metallurgy, inspection and research, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., were co-chairmen.

The report of committee A-9 on ferroalloys was presented by Charles McKnight, International Nickel Co., New York, and chairman of the

(*Continued on page 71*)

(*Continued from page* 68)

group. To bring the nine existing specifications for ferroalloys into closer agreement with commercial practice and requirements, the report, which was adopted at the meeting, recommended revisions in the following standards: Specifications for spiegeleisen (A 98-27); ferromanganese (A 99-27); ferrosilicon (A 100-27); ferrochromium (A 101-27); ferrovanadium (A 102-27); molybdenum salts and compounds (A 146-34); low carbon ferromolybdenum (A 145-34); ferromolybdenum (A 132-34); and ferrotungsten (A 144-34).

An extensive report of the activities of committee A-1 on steel was presented by the committee chairman, H. H. Morgan, rail and fastenings department, Robert W. Hunt Co., Chicago. The report adopted at the meeting includes, tentative revision in the standard covering specifications for alloy steel castings for valves, flanges and fittings for service temperatures from 750 to 1100 degrees Fahr. (A 157-36).

Cracks in Steel Castings

Peter R. Kosting, Watertown Arsenal, Watertown, Mass., presented a paper entitled "Surface Cracks on Large 18 per cent Chromium, 8 per cent Nickel Alloy Steel Castings," in which it was pointed out that castings of that type with large cross section are likely to have intergranular cracks starting at their surfaces and penetrating up to ⅜-inch. The author stated free machining castings are more prone to have these cracks than the regular grade. Etching usually is required to reveal the cracks. It was suggested that fine grain castings will not be prone to such cracking if cooled either quickly or very slowly and that they may exhibit such cracks if cooled at an intermediate rate. Mr. Kosting brought out the fact that quenching such large castings from high temperatures is limited to a very thin skin which easily may be removed through fabrication.

Report of Committee A-5 on corrosion of iron and steel was presented by W. H. Finkeldey, Singmaster & Breyer, New York, who recently was elected chairman of that committee. The report, adopted at the meeting, contains a new tentative standard covering the method of test for uniformity in coatings by the copper sulphate dip test (Preece test) on zinc coated (hot galvanized) steel castings and forgings, gray iron castings and malleable iron castings.

A symposium on impact testing featured the Tuesday afternoon and evening sessions. It is interesting to note that the first paper presented before an annual convention of the A.S.T.M. was on that subject. The first session of the symposium had President A. E. White and M. F. Sayre, professor of applied mechanics, Union college, Schenectady, N. Y. as co-chairmen.

In the first paper Sam Tour, vice president, Lucius Pitkin, Inc., New York, described a number of utility and nonstandard impact tests and suggested the wider use of the impact type of test in industry even though a full theoretical or mathematical analysis and explanation of results cannot be made. In Mr. Tour's opinion, the fact that the numerical results are obtained in a nonstandard test should not act as a deterrent to the use of these methods. The speaker also stated that the expensive refinement of a milled notch in one side only and of a flattened striking area on the specimen have been shown in work that has been done to be unnecessary.

A paper "Practical Application of the Notched Bar Impact Test" by G. C. Riegel and F. F. Vaughn, Caterpillar Tractor Co., Peoria, Ill., was presented by Mr. Riegel. The authors reported that in their experience, the utility of the notched bar impact test lies in its ability to detect and evaluate the effects of many factors upon which the quality and reliability of steel and iron products depend. These include relative metal quality aside from that associated with dynamic loads, the reliability of the quality of heat treatment and the relative sensitivity to cleavage under conditions of suddenly applied stresses, or frequent overloading by gradually applied stresses.

Measure Dynamic Loads

D. S. Clark, assistant professor of mechanical engineering, California Institute of Technology, Pasadena, Calif., described a new type of tension dynamometer in a paper prepared in collaboration with G. Datwyler, research fellow in aeronautics of the same institution. In testing both ferrous and nonferrous materials the authors found that in most cases yield forces under dynamic conditions are higher than those under static conditions. In the lively discussion following presentation of this paper it was declared that the results were not in entire agreement but that the experiments represented a further forward step in the measuring of dynamic loads.

Although the behavior of metals under impact, and the significance of impact tests have been the subject of much investigation, confusion is rather prevalent as to the fundamental factors affecting the energy that metals will absorb under rapidly applied stresses and as to the influence of form and size of specimen on the total work. So declared D. J. McAdam Jr., metallurgist, national bureau of standards, Washington, in a paper on the theory of impact testing prepared jointly with R. W. Clyne, sales engineer, American Steel Foundries, Chicago.

Mr. McAdam drove home the important point that an impact test should not be viewed as a simulation of shock in service, and should not be limited to metals that are to be subjected to impact in service. The object of an impact test should be to determine whether a structure or machine would be in danger of failure from brittleness under service conditions, he said.

In making an impact test, Mr. McAdam said that the depth and sharpness of the notch in the material tested and the velocity of deformation should be more than enough to allow for any effect of form and size of the machine or structure. Further, allowance should be made for a possibly lower temperature in service than during the impact test. If such a test made on representative specimens results in granular fracture and low impact value typical of cold brittleness, the material probably is unsuitable for service. This unsuitability might be attributed to composition of the steel or other material, heat treatment or other causes, he said.

Contrast Types of Tests

S. L. Hoyt, A. O. Smith Corp., Milwaukee, in summarizing impact testing, drew sharp contrast between impact tests in themselves and notch bar tests. He said the notch bar test was over a century old and brought out peculiarities in material not apparent in plain bars. Mr. Hoyt also stressed the importance of temperature in making impact tests. He has found that impact values fall off considerably at under room temperatures, even as high as 50 degrees Fahr. Importance of velocity of deformation likewise cannot be overlooked, he said.

Discussion of the place of radiography in the field of testing featured the meeting on that subject held Wednesday morning under the direction of John Howe Hall, foundry consultant, Philadelphia, and G. F. Jenks, chief of technical staff, office of chief of ordnance, Washington, as co-chairmen.

H. H. Lester, Watertown Arsenal, Watertown, Mass., presented the report of Committee E-7. The committee was proposed a year ago, organized in February of this year, held its first meeting at the Rochester regional conference, and organized the present session. Dr. Lester then presented a paper "Radiography in Industry," in which he reviewed the history and progress in that type of testing. He stated while radiography was used first in the foundry, it has had its greatest development in the field of weld-

ing. In the latter field, the method has been used almost entirely in the hands of producers of welded structures. The situation with regard to the examination of castings is entirely different, for while a few of the larger companies used the equipment, for the most part the experience with regard to the examination of castings has had to do with acceptance tests made by the customer.

Dr. Lester contended that because the foundryman has not had his own equipment, he has not used radiographic testing as a means to improve the product or to control practices. In his opinion the present strong trend toward consumer testing should be reversed in the case of castings. Reasons for reluctance on the part of foundrymen to employ the method were given as follows: Unfamiliarity with the test; fear of the accuracy of results; cost of the equipment; and cost of operation.

May Destroy Confidence

George C. McCormick, vice president, General Alloys Co., South Boston, Mass., presented a written discussion of the paper in which he stated that a high percentage of the gross tonnage of castings produced by the industry are for applications not involving vital consequences. Therefore, the exploitation of the x-ray in the presumption of complete inspection of such products may result in a loss of consumer confidence in the method or a serious and logical questioning of the capacity or competence of foundries which feel that their production of a certain class of casting needs x-ray inspection to establish consumer confidence.

Through a series of slides, Mr. McCormick illustrated that a casting showing defects upon x-ray examination may perform well in service and that other castings, free from defects as detectable by x-ray may not have the degree of soundness which the consumer expects. The speaker has investigated the relationship between defects as indicated by the x-ray, and subsequent failures. While he has found cases in which eventual failure is intimately related to or identified with the defective area revealed by the x-ray, he also has found that in several investigations parts may show defects, but fail in areas which apparently are sound.

In conclusion, Mr. McCormick stated that of the fair and proper x-ray tests applied to certain types of castings, the competent foundryman has no fear. Much harm can accrue to industry as a whole if a radiographic inspection is imposed on castings or structures in cases where there neither is justification nor necessity.

Dr. Herman E. Seemann, physicist,, Kodak Research Laboratories, Rochester, N. Y., in a paper "Secondary Radiation in the Radiography of Aluminum, Steel and Lead," discussed experiments in which exposures were made with and without lead foil intensifying screens to determine their effectiveness in removing secondary radiation. Results indicate there is almost a linear increase in production of secondary radiation with increase in thickness of the material. Lead foil screens may remove almost half the secondary radiation.

A paper "A Study of Intensifying Screens for Gamma-Ray Radiography," prepared by Charles W. Briggs, physical metallurgist, U. S. naval research laboratory, Washington, and Roy A. Gezelius, metallurgist, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., was presented by Mr. Briggs. The paper reports experiments which show that when compared to the standard lead foil intensifying screens, calcium tungstate screens reduce the exposure time considerably. However, the intensity does not vary according to the inverse square law and the sensitivity or definition cannot equal that which may be obtained with the lead foil screen.

Spectrography and Metals

"Gamma-Ray Radiography" was discussed in a paper by Gilbert E. Doan, professor of physical metallurgy, and Shang-Shoa Young, research fellow, Lehigh university, Bethlehem, Pa.

A wide variety of subjects was covered in reports of committees and technical papers at the session on nonferrous metals and spectrography on Friday morning, with T. S. Fuller, metallurgist, research laboratory. General Electric Co., Schenectady, N. Y. and T. A. Wright, technical director and secretary, Lucius Pitkin Inc., New York as co-chairmen. Progress reports of committee E-2 on spectrographic analysis and on committee E-3 on chemical analysis were presented.

A description of equipment and methods used to meet a particular condition for spectral analysis was presented by C. J. Neuhaus, spectrographic laboratory, International Nickel Co., Huntington, W. Va., in a paper "An Arc Source for Quantitative Spectral Analysis." The speaker pointed out that while generally the spark method is recognized as more reliable in providing reproduceable results, conditions may arise to jeopardize the applicability of that method of excitation. The arc arrangement and the results obtained were presented in the paper.

A paper "Compressive Impact, and Other Mechanical Properties of Nickel and Some of the High Strength Corrosion-Resisting Alloys" by Charles F. Catlin, research metallurgist and W. A. Mudge, works metallurgist, International Nickel Co., Huntington, W. Va., was presented by Mr. Mudge. The paper presents compressive and impact properties for nickel, inconel, and three types of monel metal, with corresponding tension and hardness data. The authors point out that the usefulness of the alloys for vital parts of equipment is indicated by the properties determined.

Report of committee B-2 on nonferrous metals and alloys was presented by E. E. Thum, editor, *Metal Progress,* Clevéland. The committee is preparing a specification for electrolytic copper. Report of committee B-3 on corrosion of nonferrous metals and alloys was presented by T. S. Fuller, chairman, and included information on the activities of several subcommittees. Appendix to the report entitled "Report of Sub-Committee VI on Atmospheric Corrosion of Nonferrous Metals and Alloys" was presented by W. H. Finkeldey, Singmaster & Breyer, New York, and chairman of the subcommittee. The report presents the results of a third series of tests made on 24 nonferrous metals and alloys, exposed since 1931 to various atmospheres at nine test locations. The committee contemplates five such tests extending over a period of 25 years.

Recommend Standard Revision

The report of committee B-5 on copper and copper alloys, cast and wrought was presented by C. H. Greenall, apparatus development department, Bell Telephone Laboratories, New York, and committee chairman. The report, adopted at the meeting, included recommended revisions to the following tentative standards: Specifications for bronze castings for turntables and movable bridges (B22-36T); revisions of standard specifications for aluminum bronze castings (B59-36) for immediate adoption. The following two tentative standards were recommended for adoption as standard: Specifications for bronze castings in rough for locomotive wearing parts (B66-36T); specifications for car and tender journal bearings, lined (B67-36T). The committee suggests the withdrawal of standard specifications for yellow brass castings for general purposes (B65-28).

Report of committee B-6 on die-cast metals and alloys, presented by J. R. Townsend, materials standards engineer, Bell Telephone Laboratories, New York, and committee chairman, included recommendations for revisions in the following tentative standards: specifications for zinc-base alloy die castings (B86-34T); specifications for aluminum-base alloy die castings (B85-37T); specifications for magnesium-base alloy die castings (B94-37T); and

(*Concluded on page* 74)

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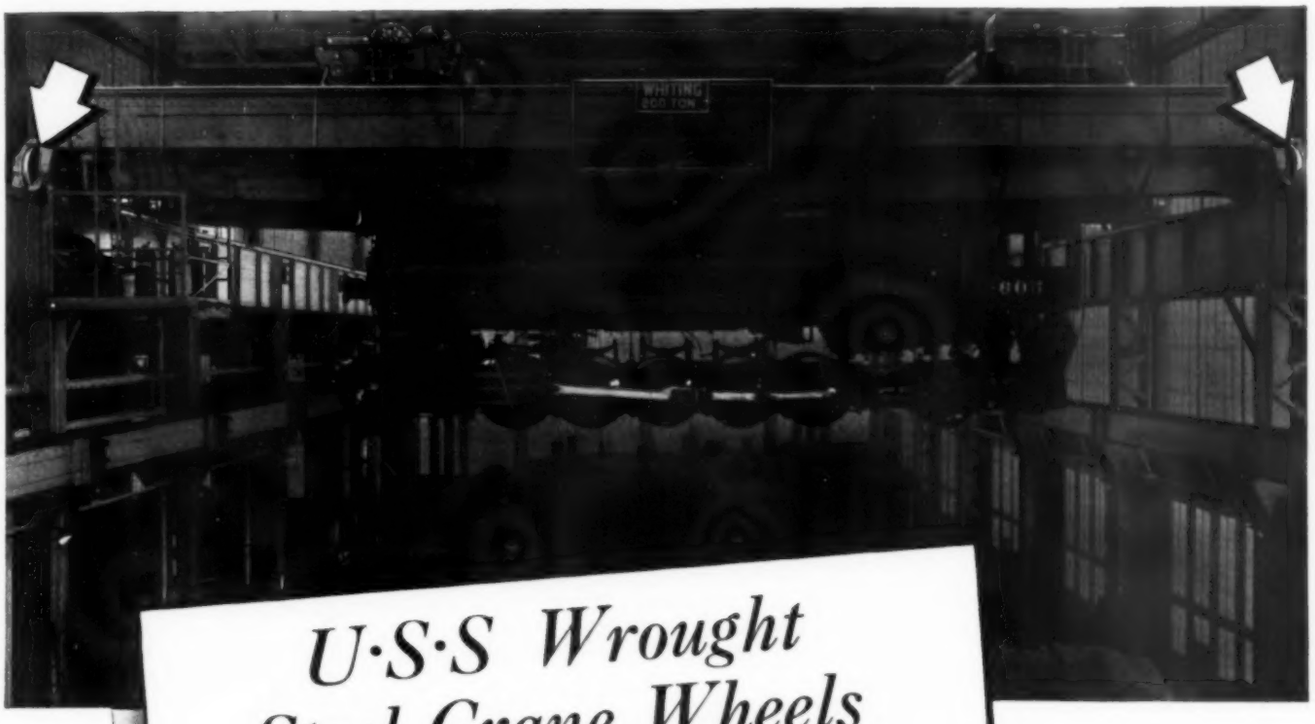

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(*Concluded from page* 72)
specifications for lead and tin-base alloy die castings (B102-35T).

Sam Tour, vice president, Lucius Pitkin Inc., New York, presented the report of committee B-7 on light metals and alloys, cast and wrought. The report includes recommendations for a new tentative standard covering methods of test for dielectric strength of anodized aluminum and includes revisions of the following tentative standards; magnesium-base alloys sand castings (B80-36T); magnesium-base alloy ingot for remelting (B93-36T); aluminum-base alloys in ingot form for permanent mold castings (B112-37T); and aluminum-base alloy permanent mold castings (B108-37T).

Report included a paper "The Effect of Foundry Variables on the Mechanical Properties of Sand-Cast Tension Test Specimen" by H. J. Rowe, metallurgist engineer, Aluminum Co. of America, Cleveland. Mr. Rowe pointed out that while many variables discussed may not in themselves result in a sufficient reduction in the strength of aluminum alloy test specimens to be considered serious, accumulative effect of several insignificant conditions may become appreciable. The speaker warned that it is not correct to assume the effect of all individual factors are numerically additive. However, it is quite possible to reduce the tensile strength of aluminum alloy test specimens as much as 40 per cent by the cumulative effect of the conditions considered. The necessity of strict control in all phases of production of such specimens therefore is essential if subsequent tension tests are to be of maximum value.

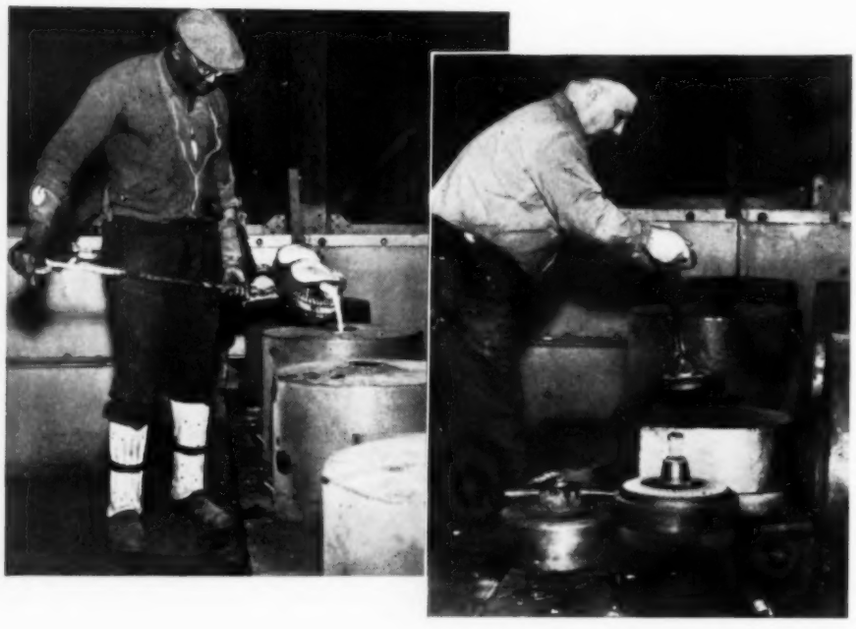
Stow Mfg. Co. Inc., Binghamton, N. Y., has appointed Frederic B. Stevens Inc., Detroit, as representative in Michigan, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont and Canada; Hill Griffith Co., Birmingham, Ala., in North Carolina, South Carolina, Georgia, Alabama, Tennessee, Arkansas, Texas, Oklahoma, Louisiana, and Mississippi; George F. Pettinos, Philadelphia, in Wisconsin, Iowa, Minnesota, Delaware, Maryland, Virginia and West Virginia; Midwest Sand & Supply Co., Edwardsville, Ill. in Kansas, Missouri and Kentucky; and Western Foundry Sand Co., Seattle, in Washington, Oregon, Wyoming, Idaho, Vancouver and Victoria.

Nominate Officers

Nominations for officers of the American Society of Mechanical Engineers for 1939 were announced at a recent meeting of the nominating committee held at St. Louis during the semiannual meeting of the society. For president, the committee nominated Alexander G. Christie, professor of mechanical engineering, Johns Hopkins university, Baltimore. For vice presidents, nominees were: Henry H. Snelling, Snelling & Hendricks, Washington; W. Lyle Dudley, vice president, Western Blower Co., Seattle; James W. Parker, vice president and chief engineer, Detroit Edison Co., Detroit; and Alfred Iddles, application engineer, Babcock & Wilcox Co., New York.

For managers, the committee chose: Clarke Freeman, vice president, Manufacturers' Mutual Fire Insurance Co., Providence, R. I.; Willis R. Woolrich, dean of engineering, University of Texas, Austin, Tex.; and William H. Winterrowd, vice chairman, Franklin Railway Supply Co., Chicago. Election of the officers of the society will be held by letter ballot of the membership in September.

Centrifugal Casting of Blanks for Gears



SPINNING molten steel at high speed to form cast steel parts is an experimental development of the Ford Motor Co., Dearborn, Mich. Centrifugal casting of blanks for transmission cluster gears and ring gears is, according to R. H. McCarroll, Ford metallurgical engineer, entirely successful, resulting in stronger, lighter and less expensive gears than those produced by conventional forging methods.

Mr. McCarroll explains, "In the first place, centrifuging insures a sound casting, free of blow holes and shrinks. But still more important is the fact that any remaining crystal structure in the metal runs perpendicular to the forces the gear teeth will be subjected to in actual use. In a forging, on the other hand, the flow lines formed during forging are parallel to the lines of force. Therefore the centrifugally-cast steel gear is stronger than the forged gear."

In Experimental Stage

At the left in the accompanying illustration, molten steel is being poured into an experimental centrifugal mold while at the right a ring gear blank is being taken from the mold at the Ford plant. Approximately 3 minutes after the metal is taken from the melting furnace it is cast into a gear blank. The mold is spun at 600 revolutions per minute for the ring gear blank and at 800 revolutions per minute to produce the transmission gear blank.

Because more exact formation of the gear blank by casting eliminates excess metal that the forging process leaves for machining and remelting and because a stronger gear results, it is expected that the company will develop the operation on a production basis.

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Steels Designed For Use

(*Continued from page* 29)

a heat of steel will really be; namely, composition, casting temperature, and rate of pouring. Each is of individual importance, and they are so inter-related that each must conform to, or be right for, the other two.

The term casting temperature is rather indefinite. American practice favors cool pouring and this is particularly true of certain types of alloy steels, especially those containing nickel. Pouring temperatures need be governed accurately so as to steer between the grave dangers on each side; namely, external cracks and deep piping in casting from too hot or too fast pouring, and that of causing external roughness and of increasing the quantity of inclusions by too cool pouring. It is evident that if a hot steel is poured very slowly, we might say indefinitely slow, it will be equivalent to cool pouring.

Proper Pouring Temperature

It is well known that for pouring any given casting, there is a best or ideal temperature for the metal. Too great deviation from this temperature, above or below, will lead to some degradation in the quality of the product.

Each heat of steel and each casting of the heat, forms in itself a problem for the man in charge, whose judgment and experience must now be called into operation, since it is well nigh impossible to lay down rules governing pouring. In all cases, the most experienced man should watch the steel in each casting, as it rises in the mold, and judge the temperature of the metal, the speed of pouring for each, as the proper rate of pouring cannot be pre-determined, rather it is estimated.

Effect of temperature on crystallization, and particularly in formation of *chill* dendrites in the outer mold is most important. The hotter the steel as it enters the mold, the longer time these dendrites will be in forming, the larger they will be. The freezing metal in forming them will reject the nonmetallic substances it contains, both solubles and insolubles, causing them to collect along the grain boundaries where they form relatively weak interfacial layers.

Nonferrous metallic solubles include carbon, sulphur, phosphorus, and oxygen, combined with iron as carbides, sulphides, phosphides and ferrous oxides, all but the carbides being harmful. The insolubles are chiefly oxides or iron, manganese and silicon, or the oxides of the special alloy, more or less completely combined as silicates and sulphides. This concentration of impurities along the grain boundaries is quite enough to account for the poor quality in steel.

Only when the general principles underlying the handling of molten metal are understood clearly can satisfactory results be accomplished, and the making of special steel castings be reduced to something approaching an exact science. When these principles are not understood and applied, trouble is sure to be encountered, and the production of special steel castings becomes merely a haphazard rule of thumb practice.

Bottom pour ladles have the advantage that the coating of slag which covers the metal acts as a protection from drafts and from hasty chilling, and on account of the stream being drawn from the bottom of the ladle through the nozzle, the entrained slag permeating the bath of metal just tapped constantly is rising to the surface away from its exit. Thus, metal will remain hot much longer, and far less slag is drawn into the mold. One of the drawbacks in using the bottom pour ladles is the fact that nozzles and stoppers frequently cut out, leak, or break.

Avoid Cold Shuts

Another type of ladlle consists of the teapot ladle, in which the steel is poured from an especially constructed ladle with a separate spout. Steel should be poured into each mold without the slightest interruption, lest we form a *stop pour*, a slight freezing of the upper surface of the metal where it touches the mold, and which will fail to remelt completely when pouring is resumed.

Shrinkage is possibly the greatest trouble that the foundryman has at the present time. This is a phenomenon which is characteristic of all materials as they cool from high temperature. We should remember that shrinkage is divided into two phases, liquid and solid. As material is poured against the cool surface of the mold, a skeleton of the shape of the cavity immediately is frozen.

Metal inside that frozen skeleton now can give up its heat only by conduction and convection through the solid envelop, which, in turn, must pass the heat through the sand which is momentarily getting hotter. This skeleton which now has assumed the size and shape of the sand mold, becomes thicker as more metal is added. Consequently, sections of a large mass require a relatively long time to freeze.

Remembering that, at pouring temperature, the metal just filled the mold, by the time the center freezes, it has become much denser and materially smaller, although the initially frozen skeleton still retains approximately the size of the mold. Unless this metal is fed continually, the void formed in the center will be a dangerous, spongy spot, and the center of segregation which migrates to the last metal freezing.

Therefore, it is necessary in pouring steel to be sure the riser is of sufficient mass that the metal will remain fluid until the casting it feeds has set and drawn the necessary metal from the riser to make it solid. Not only must the riser remain fluid, but the neck as well, which usually is accomplished by making the neck as short and bulky as possible.

The designer always should avoid locating heavy sections where it is impossible to feed them. The foundrymen has several other resources that he can call on to feed sections poorly located, but they usually are uncertain and makeshift and a successful casting is difficult to obtain.

Further Effect of Shrinkage

After the casting has set or is frozen, it continues to shrink until it reaches atmospheric temperature. This can be called solid shrinkage and is continuous, except for a slight reheating or microscopic expansion at the recalescent point. This is the shrinkage which causes cracked and warped castings and is one of the difficult problems with which the foundryman has to contend.

As a casting cools, with its thin-walled section and large surface exposed to the cooling of the sand, it sets almost as soon as poured, but the cooling action of the sand exerts less effect toward the center or the heavier section. Consequently, as the center section shrinks more and more, pulling on the rigid outside fibers, the strain becomes too great and rupture occurs. The designer should remember that if the casting can be so designed that it cools uniformly, there will be no shrinkage strains or rupture or possibility of deformation.

There are several ways in which the foundryman can combat weakness at such points. The first, by the use of large fillets, the second, chills may be incorporated against the heavy sections, and third, proper risers which are probably the best method, providing a more necessary uniform thickness of metal

(*Concluded on page* 78)

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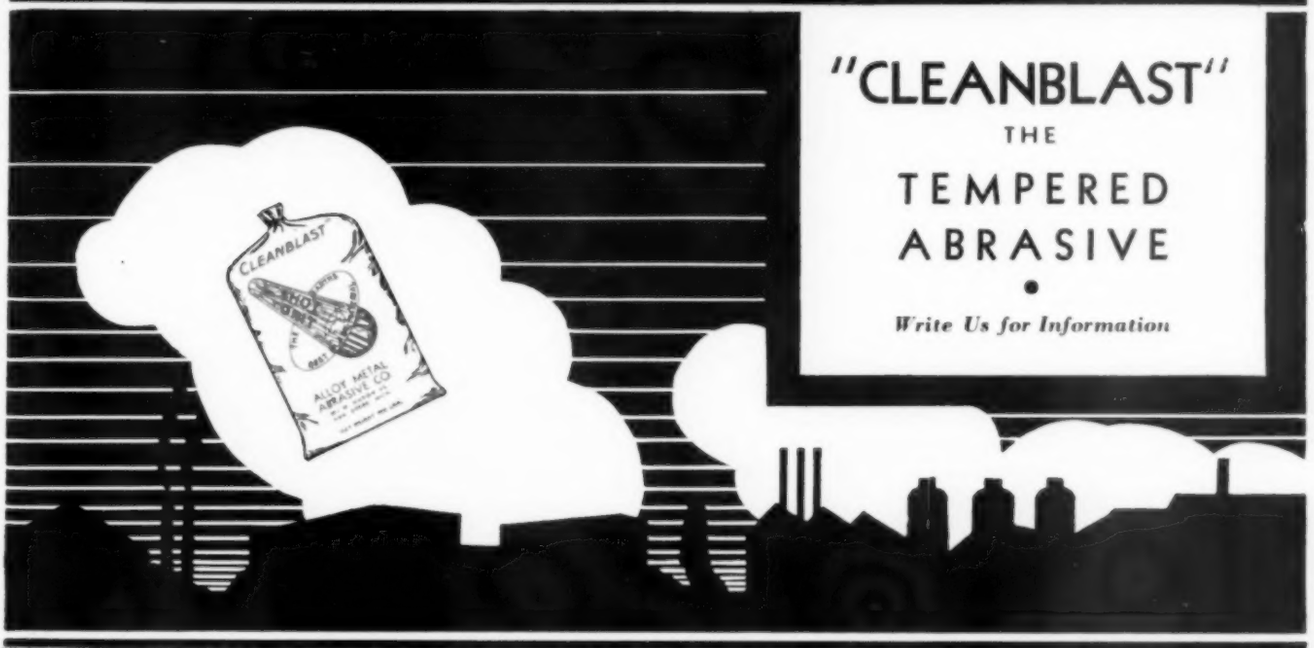

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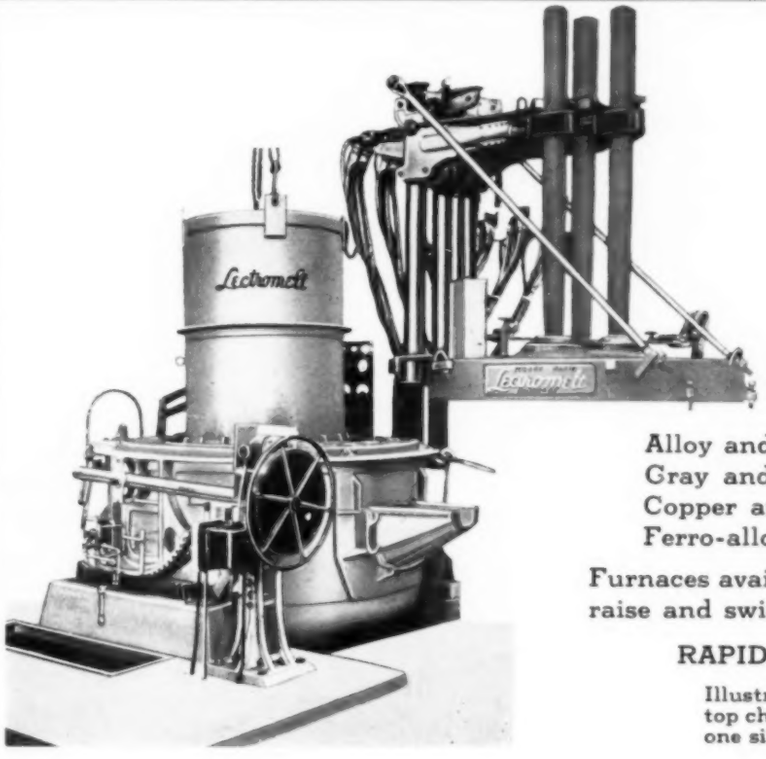

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(*Continued from page* 76)

which will cool at a fairly uniform rate.

Frequently it is necessary to carry these risers down to the face of the casting in such a manner as to form a pad on the outside which must be machined off. This pad with the section of metal to which it is joined terminates in the riser and provides a heavy section which will stay fluid and feed the casting properly.

Blowholes usually are rounded cavities, either spherical, elongated, or flattened. Walls of blowholes often have a shiny appearance and sometimes a silvery metallic luster. At times the walls are dark, almost blue, while occasionally they are colored. Blowholes may be large, but often they are extremely small. Minute blowholes are known as pinholes. They rarely occur on the drag face, but are found on the cope surface underneath the risers and at times throughout the body of the casting.

Blowholes are gas cavities caused by bubbles of gas being trapped in the metal. This gas often comes from materials in the sand, and in some cases is formed within the metal itself. Recent investigation has shown that solid metal will hold only small amounts of gas in solid solution. Solidification, therefore, will throw any gases present out of solution with consequent formation of free gas in the metal.

Action of dissolved gases in water furnishes an interesting comparison. When water is heated, air separates from the water considerably under the boiling point, and when water is cooled, air may again be dissolved in water. When water is frozen, as ice, the gas again separates. For instance, surface and some well waters contain so much air which separates so easily on freezing that clear ice cannot be made. When distilled water is used, the gas concentrates in the last part frozen, and separates out on the final freezing. This causes the white center we often see in ice blocks.

Gases may be dissolved in liquid steel through some irregularity in the melting process or through improper handling. It is a well known fact that oxygen promotes wildness and causes loss of fluidity. Numerous pinholes on the cope side are generally due to the reaction between sulphur and oxygen with the formation of volatile sulphur oxides. All castings contain blowholes at some stage of the pouring process, and unless the metal is sufficiently fluid for these to pass through, bubbles are entrapped and blowholes result.

Moisture in the molds or sand is decomposed easily when molten steel is passing through at high temperature, forming hydrogen and oxygen. The latter element probably combines with iron to form magnetic oxide, silica and carbon oxides, the latter being gaseous.

Careless pouring and improper temperature, therefore, are often the source of blowholes, shrinkage, external and internal defects, and unless care in practice is taken in the manufacture of special steels, trouble is bound to result at this point.

Czechoslovaks Hold Foundry Meeting

Fifteenth general meeting of the Czechoslovakian foundry association was held in Zlin from May 19 to 22, and 150 members and guests took part, including the managing directors of the Bata works and representatives of the foundry associations of Hungary and Yugoslavia. Zlin was chosen as the meeting-place because that town is symbolical of the work of Tomas Bata and his collaborators.

After the opening session, a visit was made to the Bata works, including a new type of foundry where castings in gray iron, steel, bronze, yellow and light metal are produced for the firm's own requirements. The tanning works, spinning and weaving mills, factory for producing shoe-cream, and the paper mill were also visited. In the river shipyards were seen the construction of the boats for service on the canal built by Bata, which so far is open only from Batov to Hodonin and is but a section of the canal which will connect the industrial district of Zlin with the Danube.

During the meeting, honorary ensigns of the association were bestowed upon F. Hase, professor at the technical university of Prague, K. Pitucha, inspector of the Vitkovice ironworks, and K. Macecek, foundry master at Brno, and Prof. Albert Portevin, of the Ecole Superieure de Fonderie, Paris, was elected an honorary member of the association.

On Saturday, May 21, a visit was paid to the grave of Tomas Bata, on which a wreath was laid, and this was followed by a visit to the Bata memorial, the technical museum and the picture gallery.

At the technical session held in the afternoon, the following papers were presented: "Principles that Led to the Foundation of the New Foundry," by M. B. Sevcik, director of the Bata engineering works; "New Directions in the Production of Gray Castings," by Dr. Lad. Jenicek; "Development of Insulation of Industrial Furnaces," by Dr. J. Robitschek; "How to Reduce the Quantity of Fuel in the Drying Plant of Foundries," by Prof. Ing. B. Holman. At the conclusion of this session, a film showing the production and the manner of working aluminum was given.

At the general meeting, all the members of the previous central committee, with the exception of one, were re-elected for the next two years, with Prof. Dr. Mont. Fr. Pisek as president. The 1939 congress will probably take place at Plzen. D. Cipera, who spoke in the name of Dr. J. A. Bata, gave a speech on the needs of Czechoslovakian economic life, in which he stated that the country's industry has to fight many obstacles originating in geographical position and the disadvantageous shape of the state, and in the fact that the country depends largely on the importation of raw materials and the exportation of its own products. The solving of the problem of transport—by canal construction, long-distance road and rail communication, the arrangement of freight charges and the establishment of a central institute of research for the heavy industries—is of particular importance.

On Sunday, May 22, there was a motor-coach excursion to Velehrad and to Luhacovice, Velehrad being a famous place of pilgrimage in Moravia, and in the evening the party left for Moravska Ostrava, where the works of Vitkovice and Trinec were visited.

Book Review

Metallurgie, by R. Cazaud, fabrikoid, 393 pages, 3¾ x 5¾ inches, published by Dunod, Paris, France, and supplied by THE FOUNDRY, Cleveland, and in London by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster.

This handy, pocket-size compendium is the fifty-fourth edition of a well known work which is printed in French. It is divided into 7 principal sections of which the first deals with general metallurgy. That section covers metallurgical agents, metallurgical apparatus, and apparatus and procedure for electrometallurgy. The second section relates to methods of testing metals and discusses mechanical tests, corrosion tests, metallography, microscopy and macrography.

Part III discusses heat treatment and thermochemistry while Part IV is concerned with the metallurgy of iron. Metallurgy of nonferrous metals is the topic of the fifth part. Additional sections relate to precious metals and special metals such as ferrochrome, ferromolybdenum, etc. The book also includes an appendix containing brief rules of mathematics, tables of measures, etc.

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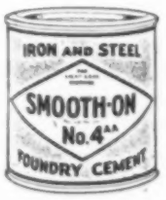

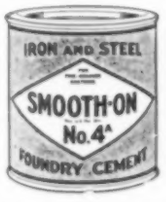

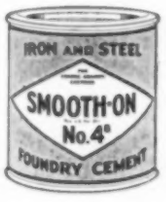

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British Hold Meeting

(*Continued from page 30*)

Names of the recipients of diplomas for outstanding papers given before the institute's branches during the year then were announced, the diplomas being handed to: A. Tipper, Fordath Engineering Co., Ltd., West Bromwich, Staffordshire, (Birmingham branch); A. Phillips, of the Lancashire branch; P. C. Fassotte, member of the Association Technique de Fonderie, of Belgium, and member of the institute; B. McDougall, of the Scottish branch, and J. Cameron, jr., son of J. Cameron, Cameron & Robertson, Ltd., Kirkintilloch, past-president of the institute.

Award Honorary Membership

The meeting then elected unanimously as an honorary member E. J. Fox, managing director of Stanton Ironworks Co., Ltd., in recognition of the great services that he has rendered to the institute and the industry.

The meeting then proceeded to the election of its officers for the year 1938-39. Joseph Hepworth, member of parliament and director of Bradford Piston & Piston Ring Co., Ltd., was elected president; W. B. Lake, governing director of Lake & Elliot, Ltd., Braintree, was elected senior vice-president, and Major Richard Miles, associated with the firm of Teesdale Ironworks, Thornaby-on-Tees, was elected junior vice-president.

Following a vote of thanks given by acclamation to C. W. Bigg, the retiring president, the meeting elected five members of the council for a period of two years: H. Bunting, past-president of the East Midlands branch; Dr. A. B. Everest, Mond Nickel Co., Ltd., London, past-president of the London branch; J. W. Gardom, chairman of the technical council and technical committee; Ben Hird, past-president of the Wales & Monmouth branch; F. K. Neath, past-president of the West Riding of Yorkshire branch and convener of the literary and awards committee. At the meeting of the council, which had been held recently, S. H. Russell, director of S. Russell & Sons, Ltd., Leicester, was re-elected as honorary treasurer of the institute, and Tom Makemson was re-appointed secretary.

The opening meeting was held Wednesday morning, June 15, with C. W. Bigg, managing director, Qualcast, Ltd., Derby, retiring president of the institute, in the chair. An address of welcome first was given by Alderman Henry Hudson, the Lord Mayor of Bradford.

The chairman then proceeded to induct the new president into the chair, and exchanged his badge of office with Joseph Hepworth, who gave his presidential address. In referring to engineering developments that have taken place in Bradford, the speaker said monastic records show monks were engaged in extraction and manufacture of iron in and around Bradford from early times, the monks of Rivaulx Abbey having been granted mineral rights, in districts now part of the city, in the year 1150. He also mentioned that Bradford has the distinction of being the birthplace of the highest grade of iron in the world. After giving a sketch of the engineering activities of Bradford, especially as regards textile manufactures and the casting of metals, the president referred to the work of the institute and its influence on the present-day foundryman.

Papers presented Wednesday morning, June 15, were divided into two sessions, one of which comprised a symposium on nonferrous subjects. The other session included a paper on the Randupson process, a paper on stresses in castings, and a paper on steel foundry practice.

Discuss Steel Molding

The paper entitled "Randupson Process of Cement Molding" was presented by F. W. Rowe, chief metallurgist, David Brown & Sons (Huddersfield), Ltd. This process was first described in the June, 1933, issue of THE FOUNDRY, and was described further in the December, 1935, January, February and March, 1936, and November, 1937 issues. Interesting developments have taken place in the light of the experience of the past 5 years, are shown in Mr. Rowe's paper. The author reviewed the advantages and disadvantages of the process, and described its applications.

The discussion was opened by E. Longden, Manchester, who, referring to a certain casting illustrated in the paper, said that he did not agree that such a system was good for that type of casting. He emphasized the time that is necessary to go through the cycle of operations, especially if the output is relatively small. He referred to another casting which, from the illustration, appeared to necessitate a large number of irons to make up the mold, and pointed out that the use of these irons is of extra expense. On the whole, the speaker questioned the economic possibilities of the system, and pointed out that in certain cases it was necessary to use flasks.

In his reply, Mr. Rowe stated that the process is not intended to compete with green sand molding. He pointed out, however, that some green sand molds may take a week to be dried and completed, whereas with the Randupson process the same mold could be finished in a day, and that, notwithstanding the time taken for setting, considerable time would be saved on such a mold.

One speaker mentioned the cost of breaking up the molds. He also referred to a passage in the paper dealing with certain savings that can be effected by the process and asked whether these savings had been calculated by comparison with a mechanized or nonmechanized foundry.

Process Is Adaptable

R. Ballantine, Fulwood Foundry Co. Ltd., Mossend, Glasgow, stating that he was responsible for the making of 200 tons of casting a week, expressed considerable interest in the subject and agreed with another speaker that the process is a distinct advance, but that it must be adapted to certain classes of casting. Ben Hird, Stamford, Lincolnshire, questioned the contraction of the mold and asked whether it was difficult to take the casting out of the mold.

Mr. Rowe answered that, in his experience, they had no worry with contraction and that, in fact, many steel castings of a certain pattern were made without brackets. A visitor, who operates a foundry in Hong Kong, asked whether the fact that the humidity of a foundry in certain climates might be up to 80-100 per cent would affect the operation of the process, and the author of the paper replied that the setting time is more affected by temperature than by humidity.

The next paper, contributed by L. E. Benson and H. Allison, Metropolitan-Vickers Electrical Co. Ltd., was entitled "Relief of Internal Stress in Castings." The authors expressed the opinion that distortion of castings and forgings during machining is due to a large extent to internal stresses that have taken place initially, and that these stresses are revealed only when the removal of metal on machining disturbs the balance of the stresses. Another fallacy which the authors wished to explode was that, in steel castings and forgings, objectionable internal stresses revealed by machining are due to casting or forging conditions. The authors described experiments which they had made on cast iron, carbon steel, admiralty gunmetal and high-tensile bronze to obtain information regard-

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(*Concluded from page* 80)

ing the degree of stress relief to be obtained from different annealing treatments.

In the discussion, Dr. A. B. Everest, Mond Nickel Co. Ltd., London, said practical experience shows some castings can be heat-treated at a relatively low temperature, and queried the temperature of 550 degrees which the authors appeared to indicate as a minimum. He also suggested that it is more important to deal with high stresses that are localized than to deal with the uniform stresses spread over a casting. E. Longden, referring to a remark made in the paper that ageing does not relieve stress, said that, in his opinioin, it does bring about relief, and he added that ageing is greatly helped by vibrations. T. H. Turner, Doncaster, confirmed that rumbling relieves stresses, and the point also was confirmed by Ben Hird and F. J. Cook.

C. H. Kain, Lake & Elliot Ltd., Braintree, asked for a definite maximum figure for the cooling rate. In reply, the authors stated that the rate of cooling depends upon the shape and the mass of the casting, and that it is impossible to give a precise answer. Large castings should be cooled for days and sometimes for weeks in the furnace for the full effect of the heat-treatment to be obtained.

Steel Foundries Are Alike

"English and American Steel Foundry Practice" was the title of a paper by Dr. C. J. Dadswell, English Steel Corp., Ltd. In his conclusions, Dr. Dadswell stated that a study of American steel foundry practice dispels the prevalent impression that American products are much inferior to British, and he illustrated this conclusion by giving a review of the organization, molding technique, sand preparation methods and heat-treatment methods that he has observed in his study of American practice.

The nonferrous session comprised two papers on aluminum alloys and one paper on brasses. The first paper presented at the session was the exchange paper of the Association Technique de Fonderie, of France, entitled "Heat-Treatable Aluminium-Silicon Casting Alloys", by Gaston G. Gauthier, head of research department, Compagnie Alais, Froges et Camargue, Chambery. The author gave some results obtained in researches made on heat-treatable aluminum-silicon alloys containing, in addition, magnesium, manganese or cobalt. The paper includes tables giving variation of mechanical properties under influence of heat-treatments and under influence of variations in contents of silicon, iron, magnesium, manganese, cobalt and sodium. The author stated that heat-treatable aluminum-silicon casting alloys represent a considerable advance over ordinary silicon alloys in mechanical properties. These alloys also possess casting qualities almost equal to those of ordinary aluminum-silicon alloys. He also stated that while it is true these properties are surpassed by certain alloys containing copper and titanium, it is possible to hope that further research will improve the results obtained.

Exchange paper presented on behalf of the Technischer Hauptausschuss fuer Giessereiwesen, Dusseldorf, Germany, was contributed by Dipl.-Ing. G. Gurtler, Metallgesellschaft A. G., Frankfurt a. M., the subject being "Aluminium Casting Alloys". The author discussed various problems relating to foundry practice and metallurgy recently studied in Germany. He stated that removal of gases from the melt is best effected by a combination of salt treatment and standing in a neutral atmosphere.

Methods of Gas Removal

Absorption of gases from the mold can be reduced by lowering the pouring temperature, shortening the period of flow and increasing the rate of cooling. The influence of titanium on the fatigue strength of alpax with various silicon contents was discussed, as was the influence of various heat-treatments. In the case of this and certain other alloys, the increased solubility of Mg_2Si at high temperatures is utilized for improving mechanical properties of heat-treatment.

Third paper of the symposium was "Some Physical Factors in Casting High-Strength Brasses", by J. E. Newson, Manganese Bronze & Brass Co., Ltd., London. The author stated that the object of the present paper was to consider some of the less important factors, with special mention of those which are of interest in the casting of high-strength brasses. These alloys were chosen because they illustrate these factors very well and because they are used for some of the largest nonferrous castings in production. Among the factors studied by the author are: Specific heat; latent heat of fusion; thermal conductivity; freezing range; casting temperature; mold material. In the discussion that followed, F. Hudson, Glenfield & Kennedy, Ltd., Kilmarnock, stated that some alloys have lower life or fluidity or castability than ordinary cast iron.

The first paper given on Thursday morning, June 16, was the exchange paper of the American Foundrymen's association, written by Dr. J. T. Mackenzie, American Cast Iron Pipe Co., Birmingham, Ala., the title being "Chemical Changes of Cast Iron in Cupola Melting." This paper, which had just been received, was presented in abstract by J. E. Hurst.

A contribution from the British Cast Iron Research association was given in the form of a paper entitled "Copper in Cast Iron," by A. J. Nicol Smith. The paper records results of experimental work carried out by the association on the influence of copper in cast iron. It was decided that this investigation should first deal with the addition of relatively widely-spaced additions of copper to a series of base irons covering a wide range of composition. This preliminary investigation forms the first part of the paper, which is followed by a discussion, in greater detail, of the influence of smaller quantities of copper on a more limited range of base materials, covering approximately the engineering irons of the present day.

In the discussion, A Tipper, Fordath Engineering Co., Ltd., West Bromwich, Staffordshire, asked whether copper helps in castings having various thicknesses. In reply, the author stated that up to 1 per cent, copper is helpful, but from 2 to 3 per cent seems to have retrograde action. Mr. Simpson, of Hong Kong, mentioned the find of an arrowhead which contained some copper and dated from the beginning of the Christian era.

Reviews Melting Practice

J. Blakiston, manager of Modern Foundries, Ltd., Halifax, gave a paper on "Modern Manufacture of Machine-Tool Castings." After summarizing the properties required from the iron used for machine-tool castings, the paper reviews present-day melting practice both in the cupola and in the rotary melting furnace, molding methods, the refractory materials generally used. A few details concerning the making of two or three large castings are discussed.

Mention having been made of the practice of putting turnings in the bottom of the ladle, this question was the subject of some discussion. Daniel Sharpe, of Glasgow, stated, in this connection, that it is common practice to put sheets of tinned steel at the bottom of the ladle. F. J. Cook also explained that turnings are sometimes used, and that these are actually in the form of thin ribbons. A. Harley past-president, also mentioned this practice and said that although it is not, perhaps scientific, it seems, in the opinion of many people, to be quite effective.

The last paper on the program was a contribution from the Institute of Vitreous Enamellers entitled "Sand-Blasting as Applied to the Vitreous Enamelling Process," by H. Whitaker.

Melting Nonferrous Metals

(*Continued from page* 31)

process of pouring. These ingots then can be remelted for the production of castings.

Procedure of melting the different nonferrous alloys regularly produced in foundries is somewhat different for the different alloys. In general, copper being the high melting point element, is melted first and the remaining elements added under conditions that will insure rapid absorption by the molten copper without excessively chilling the copper. However, in the case of the copper-tin bronzes, it is preferable to reduce the copper oxide present in the molten copper before the tin and other elements are added so that they may not be oxidized through chemically combining with oxygen in the copper, and thereby reducing the amount of metallic tin and other elements in such alloys.

The best practice is to melt the copper adding to it a portion of the deoxidizing agent, such as phosphor-copper, zinc or manganese. After reducing the percentage of copper oxide of the copper, the remainder of the charge is added, excepting the remainder of the deoxidizing agent, which it will be found desirable to add after all the other elements have been thoroughly stirred in. This stirring in process naturally does cause some additional oxidation. Therefore, presence of the final amount of deoxidizing agent at this point is effective.

Place Cushion of Yellow Brass

In producing copper-zinc alloys, such as yellow brass and manganese bronze, zinc acts as a powerful deoxidizing agent to reduce the copper oxides. It is good practice to charge the copper first, together with a little of the yellow brass foundry scrap to act as a cushion upon which the larger pieces of ingots or copper are to rest. This cushion of yellow brass having a lower melting point than the copper itself, will melt first and thus help the copper to melt more promptly by the process of dissolving the copper into the previously melted cushion of yellow brass.

Zinc in the yellow brass will reduce the copper oxides as the copper dissolves, resulting in a bath of copper with a very small percentage of zinc present or at least copper that has had its content of copper oxides reduced to metallic copper and with some zinc oxide on the surface. Possibly some zinc oxide entanglements may be present in the bath, until the bath becomes thoroughly molten, at which time the zinc oxide should float to the surface. To this should be added gradually the rest of the foundry scrap; after which the remainder of the zinc should be added. This procedure refers to the production of yellow brass.

In the case of manganese bronze, the procedure is similar except that ferromanganese should be added to the copper before foundry scrap is added. The ferromanganese preferably should be added in the form of a hardener made up of the mixture of aluminum and manganese and iron in the proportions necessary to produce the desired percentages of these in the resulting manganese bronze when the proper quantity of the hardener has been so added. In this way the aluminum and iron and manganese are added in one unit; the aluminum tending to protect the other elements from oxidation by forming immediately the aluminum oxide film over the bath.

Add the Hardener First

The hardener, being made up of aluminum together with iron and manganese, has a much lower melting point than ferromanganese itself. Such a hardener may be made readily and is fractured easily into small pieces so that correct weights may be produced accurately. After the hardener has been added to the copper, then the foundry scrap should follow and as soon as the bath is again hot enough, the remainder of the zinc should be added gradually until the entire amount of the charge has been added. Of course, stirring is necessary to insure the complete mixture of all of the different elements into all parts of the bath.

In the production of these high zinc alloys, zinc is vaporized rapidly and consequently, the melting loss of zinc is quite noticeable. However, compensation for that loss is accomplished by provision of the necessary additional amount of zinc so that the resulting alloy cost will be that specified or desired. Since this melting loss varies with the conditions under which the melting takes place, the amount of agitation and stirring, and the amount of superheating that is necessary for the alloy, no figures can be given here that would be correct for all conditions.

The most satisfactory procedure is to establish or standardize on a practice and then determine what the melting loss is for that standard practice by having laboratory analyses made. After such analyses are available, obviously the amount of additional zinc necessary to compensate for that lost can be calculated readily for that standard practice. Such a standard practice must be followed regularly and no changes permitted if accuracy of analysis is to be secured. Since zinc vaporizes rapidly, a very few minutes of additional superheating of the bath will result in a marked change in the zinc content of the alloy and consequently, the analysis of the castings.

Manufacture of high strength yellow brasses or alloys, commonly known as manganese bronzes, varies with the different foundries, each of which have their preferred process. However, it generally is conceded that the most reliable method is to make up this alloy and then pour it into ingots, analyzing these ingots to determine the ratio of the zinc to the desired zinc content, and then remelting the ingots; making the necessary addition of zinc to compensate for the melting loss.

Standardizing time and all conditions under which the ingots are melted will enable accurate compensation for melting loss, thus resulting in a high grade product. Since these alloys have a wide variety of analyses, and consequently the temperature at which they must be handled will vary, no accurate data on this subject can be given here.

Stir Metal Up and Down

In producing aluminum bronze, the process is commonly as follows: Where no iron is present, the copper is melted with part of the aluminum. As soon as this is sufficiently molten the bath is stirred carefully with an up and down motion to insure the thorough mixing of the two metals. Since aluminum is so much lighter than copper, it tends to float on the copper, and therefore, requires stirring up and down to cause the copper to come up and the aluminum to go down.

After this, the additional aluminum is added and the bath is again stirred in the same way. The alloy should be skimmed carefully and then it should be poured into ingots and re-melted for casting in foundry molds. Where iron is to be present, the copper with some of the alumnium, and the iron in the form of thin sheets or finely divided particles are added into the furnace and as soon as this becomes molten, it is well stirred up and down. As soon as the bath is well mixed, remainder of aluminum is added and again well stirred as soon as molten. Then the alloy is poured

(*Concluded on page* 86)

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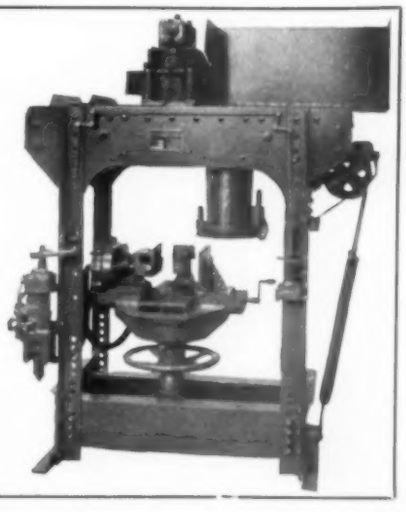

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(*Concluded from page* 84)
off into ingots and the ingots are remelted for the production of castings.

It is worthy of note that several different grades of aluminum bronze ingots are available through a number of ingot metal producers. The ingots are made under careful metallurgical control, and a high grade and uniformity of product is produced regularly. Frequently it will be found advantageous to purchase aluminum bronze ingots already made up rather than to attempt to make new aluminum bronze ingots without the presence of the proper and thorough laboratory control.

Stirring should take place after the ingots have been melted so that there can be no danger that different parts of the bath show any difference in the amount of the copper and aluminum due to the difference in the weight or specific gravity of these two metals.

Melting should take place in a slightly oxidizing atmosphere, since this alloy is highly sensitive to absorption of underburnt gases. These gases are liberated when the alloy solidifies, resulting in blow holes or gas holes in the castings or ingots so produced. Due allowance must be made for melting losses in this alloy just as in other alloys, but the presence of the aluminum oxide film over the bath tends to minimize melting loss for this type of alloy. Chemical analysis will show exactly what the melting loss is for the conditions of any given plant.

Catch Cupola Smoke And Dust

(*Continued from page* 32)

with more leisure, curiosity, desire for further information, or possibly a combination of all three, will be interested in a slightly more elaborate presentation.

Discussion over installation of the present equipment originated during a period when the management was setting up dust collection units in various parts of the plant. Although the cupola was recognized as a major dust and smoke producing unit, no precedent existed for a method of control or elimination. In other places around the plant the problem was relatively simple since the dust was collected at ordinary atmospheric temperature and therefore amenable to treatment by practically any type of dust collecting equipment. Gas from the cupola in large volume and at high temperature presented a more complicated problem. The resulting installation based on careful survey of all known and probable factors was largely experimental, but successful performance over the past year would seem to indicate that the confidence of the designers was justified. Solution of this ancient and perennial foundry problem will be of interest to many foundrymen pricked at times with a similar thorn in the side.

Preliminary estimate showed that the blowers deliver almost 10,000 cubic feet of air per minute to the two cupolas, 4600 cubic feet to one and 5200 cubic feet to the other. This air enters the cupola at atmospheric temperature, but as every practical foundryman knows, it does not leave the cupola at the same temperature. Gradually rising as the heat progresses, maximum temperature of the gas near the close of the heat is approximately 1800 degrees Fahr. Increased temperature means increased volume. In this particular instance an estimate indicated that equipment would have to be provided for handling a maximum volume of 24,000 cubic feet of hot gas per minute.

Caps Placed on Cupolas

The dust collector unit was erected in a room located a short distance from the cupolas. The cupolas were capped and an opening was cut in each shell below the cap. A steel pipe extends from each of the openings to a point in the side of the dust collector. A large suction fan, an integral part of the unit draws the exhaust gases from the cupola stacks and discharges the dust laden gases into a water spray produced by rapidly revolving rollers. The water in the tank is maintained at a constant level so that the rollers are only slightly submerged.

All the heavy particles sink immediately by gravity. Lighter material carried upward by the spray passes through a great number of inverted openings and falls back with the water into the tank, while the cooled and purified gas is drawn through an upper chamber, through the fan and into the atmosphere. The discharged gas passes through a pipe and enters an extension to the cupola stack. At the top of the stack it appears as a thin, misty vapor at a temperature of approximately 150 degrees Fahr. and almost instantly disappears.

A slat conveyor extending across the bottom of the main tank removes the sludge, first into an auxiliary tank on the outside and then over the lip of this tank from where the material falls by gravity into a container mounted on a small buggy. This container has a capacity of approximately 1000 pounds. Average amount of material collected each day is 600 pounds. The material is hauled away each day and disposed of with other miscellaneous refuse.

Distribute Pumps

Roots-Connersville Blower Corp., Connersville, Ind., has appointed the following district representatives for distribution of turbine pumps according to J. B. Trotman, manager of the turbine pump division: Arthur W. Schuster, 1025 Granite building, Rochester, N. Y., for ten counties in the west central part of the state which lies between Lake Ontario and the Pennsylvania line; John B. Foley, Jr., 249 Erie boulevard West, Syracuse, N. Y., is to cover the northeastern section of New York state lying east of the Rochester territory and north of the metropolitan area; F. S. Salchenberger, 211 Wacker drive, Chicago, will call upon the pump trade in the northeastern corner of Illinois, as well as in three counties in Indiana adjacent to Chicago; B. J. Walter, 315 West Woodbridge street, Detroit, will be in charge of turbine pump sales in the southeastern section of the state of Michigan.

Salient Features of Problem

Sources of dust: Two foundry cupolas, 48 and 64 inches inside diameter.
Kind of dust: Coke particles, iron oxide particles and silicious material.
Average air blast volume: 4600 and 5200 cubic feet per minute.
Approximate coke to iron ratio: 1 to 10.
Temperature of effluent gases: 1600 to 1800 degrees Fahr.
Solution of problem: One wet type dust collector unit.
Temperature of gases entering collector: 1400 to 1600 degrees Fahr.
Temperature of gases leaving collector: 167 degrees Fahr.
Approximate volume of gases handled: 24,000 cubic feet per minute.
Approximate amount of dust collected: 125 pounds per hour.
Total power consumption: 36 horsepower.
Water consumption: 25 gallons per minute for period of 3 to 4 hours.
Approximate oil consumption: 0.04 gallons per hour.

Electric power at $0.015 per kilowatt hour	$2.83
Water at $0.90 per 1000 cubic feet (half waste water is used)	1.06
Oil at $0.39 per gallon	.11
Total cost water, power and oil per day	$4.00

OBITUARY

FREDERICK A. LORENZ JR., 52, vice president, American Steel Foundries, Chicago, died in Passavant hospital, Chicago, July 23. Mr. Lorenz was born in Lansing, Mich., Feb. 26, 1886 and educated at the University of Chicago and University of Illinois. Graduating with a bachelor of science degree in railroad mechanical engineering he began his business and professional career with the Chicago & Northwestern Railway Co., as inspection engineer and later as plant engineer. Following a connection as rolling mill superintendent, East Chicago plant, Republic Iron & Steel Co., he joined the sales staff of the American Steel Foundries in 1911 and advanced steadily to the position of vice president and general manager of the Indiana Harbor and Pittsburgh plants of the company. President of the Steel Founders' society of America and a director of the American Foundrymen's association he has taken part in association activities for many years. In recognition of his services to the foundry he was awarded the Joseph S. Seaman gold medal at the recent A.F.A. convention in Cleveland. Other connections included member of the Durable Goods Industrial committee; Lt. Col., ordnance reserve, U. S. Army; director Chicago post Army Ordnance association; director American Management association; president Midwest Marketing society.

* * *

H. R. Atwater, 72, vice president Osborn Mfg. Co., Cleveland and connected with that company for the past 45 years, died at his home in Los Angeles July 16. Ill health in 1922 caused Mr. Atwater to resign his position as sales manager of the molding machine division of the Osborn company and move to California where he has since resided and where he represented his company and also the W. W. Sly Mfg. Co., Cleveland. Apparently in the best of health and spirits he attended the recent A. F. A. convention and exhibition in Cleveland. A native of New York state, Mr. Atwater learned the brush business and as a young man held supervisory positions in several establishments before he became connected with the Osborn Mfg. Co., October, 1893. His connection induced that firm to add to its former line of wire brushes, brooms and foundry supplies, the manufacture of bristle and fibre brushes. After getting these well under way he transferred his efforts to sales work. His close contact with foundrymen throughout the country was the principal factor which led his company into the molding machine field. He had a large part in the development of molding machines and served as head of the molding machine sales department until he went to California.

H. R. Atwater

* * *

Frederick R. Angell, 67, since 1935 president of the Northern Malleable Iron Co., St. Paul, died recently in that city. Mr. Angell was identified with the malleable iron industry all of his business life. Before 1916 he was associated with the National Malleable & Steel Castings Co. in Chicago and Indianapolis.

* * *

Harry McLeod Lewis, 65, secretary-treasurer, and one of the organizers of the Badger Malleable & Mfg. Co., South Milwaukee, Wis., died in Milwaukee, July 7. Prior to going to South Milwaukee about 30 years ago, he founded the Peerless Steel Range Works and before that was treasurer, Chicago Stove Works.

Frederick A. Lorenz Jr.

* * *

Albert Lockwood, director of purchases and plant executive, Lumen Bearing Co., Buffalo, died July 1.

* * *

John McArthur, 70, superintendent, Washington Iron Works Inc., Buffalo, and former president of the Buffalo Foundrymen's association, died in that city June 20.

* * *

George E. Emmons, 80, formerly manager of the Schenectady works of the General Electric Co. and later vice president in charge of manufacturing, died in Pasadena, Calif., July 1.

* * *

Frederick W. Becker, vice president, Brooklyn Brass Works, Brooklyn, died in that city June 25. Mr. Becker had been superintendent of the Ulmer Brewery, Brooklyn, and was also secretary and director of the Ulmer Park Realty Co. and of William Ulmer Inc., Brooklyn.

* * *

Charles A. Goehringer, 62, formerly superintendent of the Acme Foundry Co., Detroit, died July 3 at his home there. Mr. Goehringer spent about 30 years with the Acme company, and about 10 years ago went with the Ford Motor Co., working there until his retirement a year ago because of ill health.

* * *

Clarence Rudel, 63, who retired recently as president of Canadian Vickers Ltd., Montreal, Que., died in that city, June 21. A native of Cincinnati, he went to Montreal in 1902 as general manager of Canadian Fairbanks-Morse Co., becoming head of the Vickers company in 1934.

* * *

Edward Otis Goss, 72, president of the Scovill Mfg. Co., Waterbury, Conn., died at his home recently. Mr. Goss became connected with the Scovill company as draftsman in 1888 following graduation from Massachusetts Institute of Technology. He was made a director 10 years later and in 1900 became assistant treasurer. He became general manager of the plant during the World War and in 1918 was appointed vice president and treasurer and in 1920 was elevated to the presidency.

* * *

Henry T. Cole, 68, chairman of the board, United States Radiator Corp., Detroit, died at his home on June 7. A native of Cleveland, Mr. Cole became chairman of the corporation in 1936, after serving as

president for 15 years, and as vice president and treasurer for 11 years. From 1902 to 1910 he was vice president and treasurer of the United States Heater Co., and before that he was with H. Scherer & Co. He also was president of the Pacific Steel Boiler Corp.

* * *

John Hedley, 89, for many years connected with the foundry industry and an honorary member of the Northern California chapter of the American Foundrymen's association, died July 5, at the Masonic home, Decoto, Calif. Mr. Hedley went to San Francisco in 1871 from Australia, where he had gone with his parents when he left his birthplace in England in 1856. His first job in San Francisco was with the Union Iron Works, now Bethlehem Shipbuilding Corp. Later he was foreman, W. T. Garratt Co. and then he was with Steiger & Kerr. From 1891 to 1927 he was proprietor of the Western Foundry which was destroyed by fire in the latter year. He then became foundry superintendent of the Joshua Hendy Iron Works, Sunnyvale, near San Francisco, and retired from active business at the age of 81.

* * *

Henry H. Bighouse, 70, sales engineer, C. O. Bartlett & Snow Co., Cleveland, died July 23 at Cleveland after a three months illness. Mr. Bighouse was born in Cincinnati and was educated at Ohio State university. He went to Cleveland in 1904 and a year later became associated with C. O. Bartlett & Snow as a chief engineer.

Reader's Comment

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of The Foundry or of Its Editors.*

What's Ahead?

TO THE EDITORS:

A reader of THE FOUNDRY for many years, I want to congratulate you on doing a splendid job. The wide diversity of material presented in every issue makes for progress and keeps one posted on what is going on in the foundry field. Under the heading *Reader's Comment* I find open and frank discussion on many topics vitally affecting men connected with the foundry industry. I derive a great deal of pleasure and information from reading these comments. In this connection I should welcome comment on a subject in which I and a great number of other young foundrymen are deeply interested.

What opportunity is offered by the foundry industry to the usual type of boy who enters it to learn the molding trade? At present I am 32 and have been in the foundry for the past 15 years. Through hard work, study and close application I have attained the position of foreman in a large jobbing nonferrous foundry. Apparently that is the end of the road. My education is limited. My employer is reluctant to furnish me with information on the various alloys, their application, physical properties, and the proportions required of the various ingredients. In this district as in many others, there are no schools where one can secure this information. Where are the foundrymen of tomorrow coming from? From my standpoint it would seem that unless one has a sheepskin from a fancy college he has not a chance.

I am not a grouch nor a grumbler, but I would like to see men fitted by practical experience, given a chance to acquire the technical knowledge required to fit them for the higher executive positions. No reasonable person can deny that practical experience plus technical training is the ideal combination for a man in authority in the foundry or any other manufacturing enterprise. Why does not some person in the nonferrous field establish a school on the same lines as that conducted with remarkable results for many years in the ferrous field by David McLain?

A READER

Editor's note: A reader's attention, and the attention of others confronted with a similar problem is directed to the fact that articles dealing with every technical and practical phase of nonferrous foundry practice have been presented in THE FOUNDRY over a period of many years. Bound volumes may be consulted in the public libraries. For books on the subject we might suggest *The Cast Metals Handbook* published by the American Foundrymen's association; *Foundrymen's Handbook*, published by the Penton Publishing Co.; and *Gates and Risers for Castings*, by Pat Dwyer, published by the same company.

Brass Foundry

The carbon crucible, dully glowing
Is wrenched from the roaring coals below—
Swung high, to soar along a crane-beam
To the molds, ranked on wooden rails.
An old man thrusts a pyro-lance into the soup,
Casts in a scrap of metal, stirs the mix, then nods;
Then buskined, goggled men grasp the long crane-handles.
With steady, mittened paws, they tilt the flaming pot.
The fiery water spills into a narrow hole in the tamped sand;
Steam spurts from the damp, cool sand, pours out the vent.
A silvery bead sprawls forth; quick hands untilt the ladle—
The bucket moves, and so the next is filled.

—Ford Lewis Battles

Editor's note: This is presented as a young man's impression after working a summer in a foundry.

Book Review

Aluminum, by Douglas B. Hobbs; cloth; 295 pages 6 x 9 inches; published by the Bruce Publishing Co., and supplied by THE FOUNDRY, Cleveland, for $3.00; and in Europe by the Penton Publishing Co., London.

The author's long and intimate association with the aluminum industry has given him a splendid background of theoretical and practical knowledge in all branches of this important modern metal. The book is divided into two parts. The first part is devoted to the history and manufacture of the metal, casting of aluminum alloys, manufacture of basic wrought commodities, physical and chemical properties; forming, machining, joining, finishing the metal and finally, its applications. Complete, without including encumbering details, this section provides an excellent basis for the actual work with the metal which follows in Part 2.

The second part covers 25 so-called projects which have been made successfully. Smart, interesting and distinctly modern designs which bring out the qualities peculiar to aluminum are applied ingeniously to articles of wide and varied usefulness. Construction directions are complete and easy to follow and are augmented by detailed working drawings. A great number of remarkably fine photograph reproductions make clear every phase of the subject.

In the preface the author states that the purpose of the book is to provide the student with a text on aluminum which will enable him to obtain the basic principles without becoming involved in detail. The book also has been prepared to serve as a reference text for high school and vocational school chemistry classes and for the industrial arts departments of elementary, junior and senior high schools.

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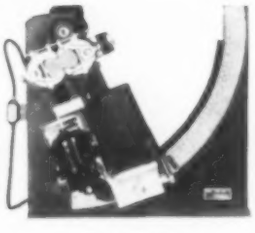

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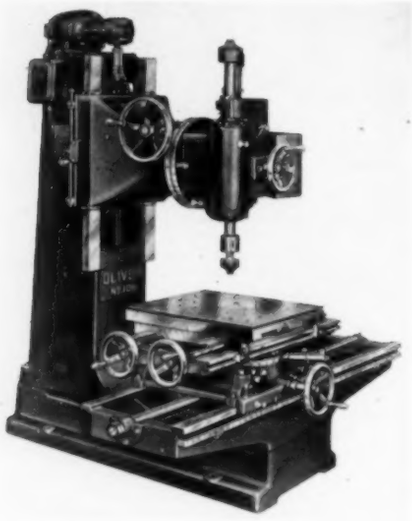
NEW EQUIPMENT and SUPPLIES

Pattern Miller

Oliver Machinery Co., Grand Rapids, Mich., recently has placed on the market a universal pattern milling machine shown in the accompanying illustration on which it is claimed nearly every conceivable operation in making patterns in wood and soft metal can be done. A cabinet of bits is provided with the machine. It is stated that



View of complete machine with spindle in normal vertical position

the machine is to the pattern shop what the milling machine is to the tool room.

The same dividing head may be used for not only cutting gear teeth, but also for dividing off and machining duplicate work on similar segments or sections. Among the uses may be listed: Coreboxes; square bends; S-bends; tees; socket ends; valve boxes; regular and irregular patterns; cross grooving, trenching; halving; jointing; recessing and routing out heavy bodies; rounding curves; shaping *U*, *D* and *C* sections; truing up sectional pieces from the saw; boring and slotting holes at any angle; facing and cutting port holes; molding straight or curved arms; gear cutting; boring; cutting fillets; dowels; cross cutting; straight corner locking, half lapping, jointing and plowing; slot mortising; shaping square to any design; tenoning, double or single; dovetailing right and left sets at one setting. The machine is designed for 2 or 3 phase, 60 cycle, 220/440 volt electric alternating current motor drive. On special order can be supplied for direct current motor drive.

Smothers Fire

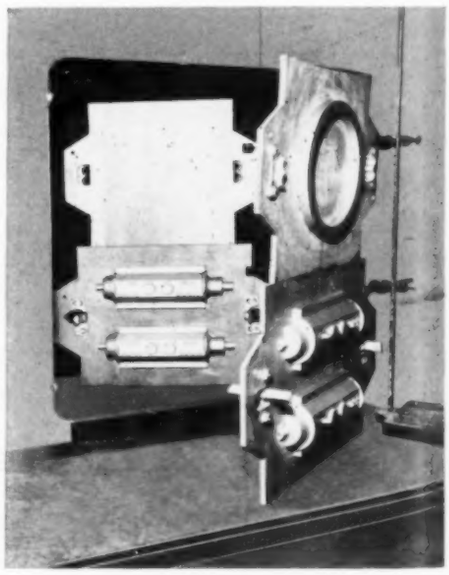
Pyrene Mfg. Co., Newark, N. J., has developed a large capacity foam-making water nozzle for extinguishing fires. The nozzle has a capacity of 500 to 750 gallons of fire-smothering foam per minute, and produces 350 gallons of foam from only one gallon of the firm's foam solution. The nozzle is said to convert a water stream into a foam stream by mechanical rather than chemical action.

When the nozzle is connected to a hose line and the water is turned on, the foam solution and air are drawn into the water stream to form foam. Only one person is required to handle the nozzle, and operation may be continued indefinitely by merely pouring additional foam solution into a knapsack carried on the operator's back. Water employed is at 75 pounds per square inch pressure or more, and only 35 to 40 gallons are required per minute.

Matchplates

Haskelite Mfg. Corp., 208 West Washington street, Chicago, recently has placed on the market a new type matchplate claimed to be stronger and lighter than aluminum. The material is plywood faced on both sides by thin steel sheets. Panels of the material can be supplied in any size and thickness.

Stock sizes are available for im-



The material lends itself readily to manipulation with wood working tools

mediate delivery to foundries where the material may be cut to any desired design. Alternatively the manufacturer is prepared to cut the material to any desired shape or size. Originally developed more than 18 years ago, the material has found wide application in all forms of transportation equipment through light weight, stiffness and ability to hold its shape.

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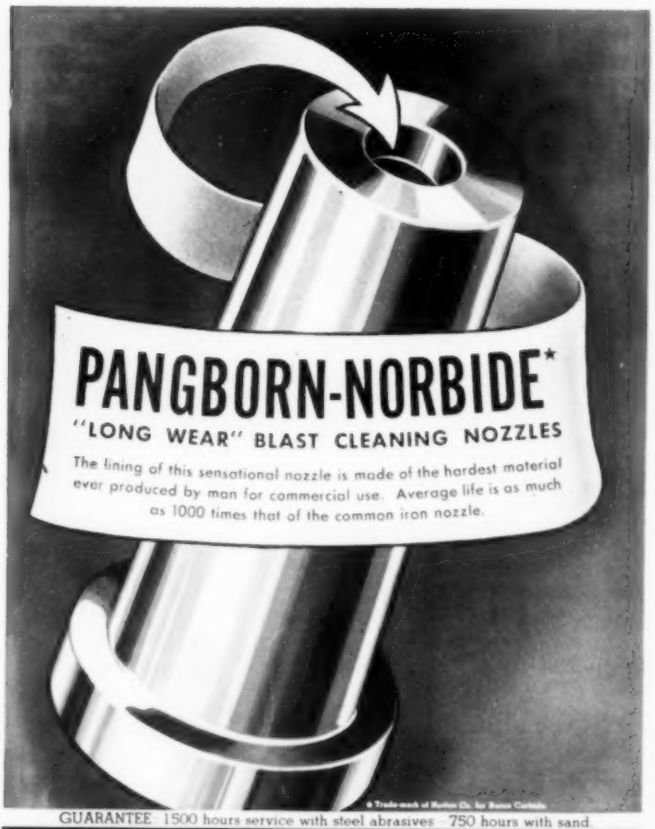
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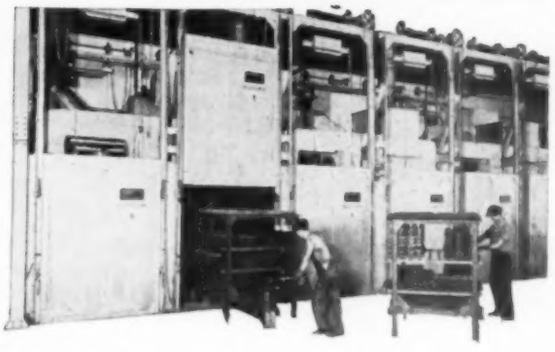

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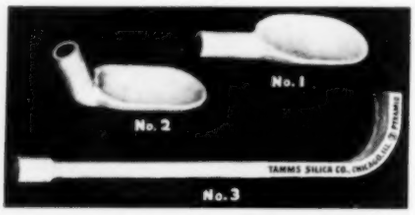
Skimmers

Tamms Silica Co., 228 North La Salle street, Chicago, has placed on the market an improved type of skimmer shown in three shapes in the accompanying illustration. It is

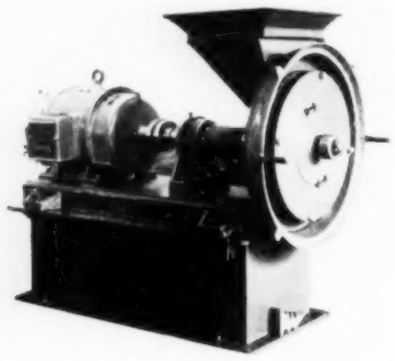


A small rod readily may be fitted in the socket for a handle

claimed that these skimmers are made from high heat resisting alloys and therefore will not disintegrate and introduce foreign material into the metal stream. In addition to resisting high temperature nonferrous metals it is stated that the skimmers are not affected by chemical action of alloy or fluxing material.

Sand Mixer

The sand preparing machine shown in the accompanying illustration and marketed through O. N. Beck, 11 Queen Victoria street, London, E.C.4, England is available in



The wheel is made up of two steel disks separated by four steel jaws

three sizes with capacities respectively of 70, 125 to 140, and 280 cubic feet per hour. The two larger sizes are stationary, while the smallest may be either stationary or portable.

Sand is fed into the hopper from which it passes into a rapidly revolving wheel made up of two steel disks separated by four steel jaws. The wheel is attached to the central shaft of the machine through a tapered steel spindle. Sand is caught by the jaws, whirled at high speed and slung against the impact ring surrounding the wheel. It is claimed that impact, enormous acceleration and second impact result in the loosening and mixing effect. Mixing is accomplished through the rotary movement of the sand between wheel and impact ring.

On a daily run of 3 hours it is claimed that the jaws in the wheel have a life of approximately 6 months. The jaws are provided with grooves which become filled with sand and this protective crust prevents the jaws from wear.

Roller Conveyor

Palmer-Bee Co., Detroit, recently has placed on the market a new line of roller conveyors. Three types of bearings are employed, namely commercial ball with capacities from 60 to 4500 pounds per roller; precision tapered roller with capacities from 1000 to 12,000 pounds per roller, and precision ball with capacities from 1000 to 8000 pounds per roller. Conveyor is gravity or power driven. Tube, bearings and frame rail are of proportionate capacity to give a balanced design. A variety of bearing seals and bearing adaptors are provided to meet all types of operating conditions and all sizes of tubes. Frame rails can be of angle, channel or flat bar construction as desired.

The commercial line for normal service has rollers ranging from 1 to 4½ inches in diameter while the precision line for medium or heavy duty has rollers ranging from 2⅛ to 7⅝ inches in diameter. Ten foot lengths are standard but the conveyors can be supplied in other length to suit requirements. Bearings may be dry, grease-packed or fitted for use of a pressure grease gun.

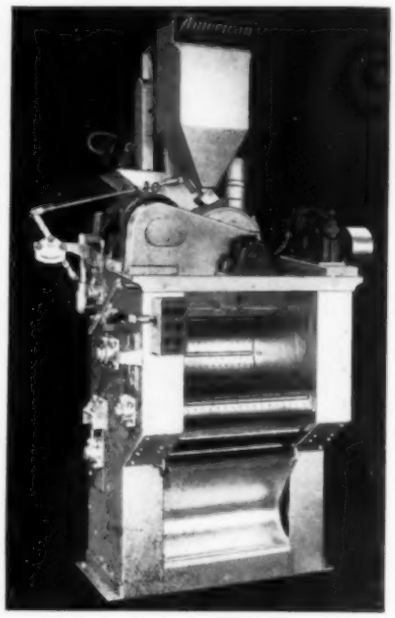
Industrial Walls

Insulated industrial curtain wall for steel frame factory buildings recently has been developed by Johns-Manville Corp., 22 East Fortieth street, New York. The material consists of a 1-inch insulating board to which a ⅜-inch sheet of asbestos-cement composition is cemented. The units are manufactured ready for erection and are said to require no special tools for fitting.

Cadmium plated bolts are used to hold the material against the steel framework of a building. Caulking compound is used on the edges of the sheets. Thermal expansion of this product is claimed to be approximately the same as that of steel so that no expansion joints are needed.

Blasting Unit

American Foundry Equipment Co. Mishawaka, Ind., has developed a small size abrasive blast barrel unit with a capacity of 2 cubic feet. The unit, shown in the accompanying illustration, is designed for a plant having a limited volume of small



Abrasive blasting unit is designed for handling a limited volume of small pieces

pieces to clean or for a plant desiring an auxiliary unit to handle moderately light loads of small pieces. The unit is known as the 20 x 27-inch model, and employs an airless, centrifugal blasting unit similar to that employed on other models made by the firm. While it is designed similar to the other units, it employs a wear-resisting rubber conveyor instead of a metal one for tumbling the work.

Spent abrasive falls directly into a hopper beneath the conveyor where it feeds into a bucket elevator which conveys it to an overhead storage hopper and sand separator for cleaning and re-use. Loading of the machine is accomplished in the conventional way and unloading is achieved by reversing the conveyor so that the work empties into a tote box, conveyor or other receptacle. A speed reducer connected with the main drive permits adjusting the travel of the tumbling conveyor so that the time of exposure beneath the blast is controlled according to individual requirements.

Foxboro Co., Foxboro, Mass., maker of industrial precision instruments and controllers, has moved its Dallas, Tex., office and branch factory to new quarters at 1710 North Arkard street.

Wide Frame Truck

A wide frame model truck has been placed on the market by Yale & Towne Mfg. Co., 4530 Tacony street, Philadelphia. The truck, shown in the accompanying illustration has a capacity of 2500 pounds. It is claimed the platform can be elevated with the handle at any point within the circle of 360 degrees. The truck is supplied with ball or roller bearings and rubber-tired, cast wheels.

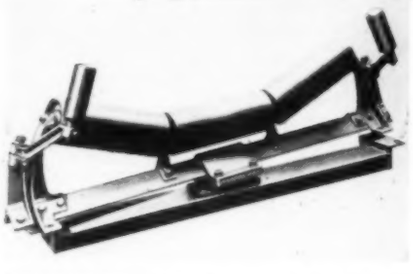
The platform can be raised with the handle at any position

Welding Electrodes

General Electric Co., Schenectady, N. Y., recently has placed on the market three new arc welding electrodes intended for shielded arc welding of mild steel. Type W-20E is designed for general purpose, single or multipass welding with alternating or straight polarity direct current. Type W-22E is designed for high quality, single or multipass arc welding with reverse polarity direct current. Type W-23E is for high welding in the flat position with alternating or reverse polaity direct current.

Belt Idler

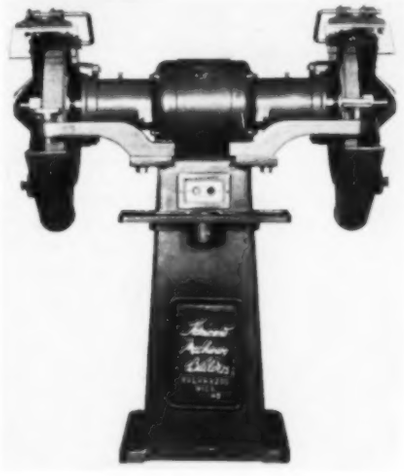
Jeffrey Mfg. Co., Columbus, O., has announced a new self-aligning idler for automatically training conveyor belts. It consists of an anti-friction idler pivotally mounted on a supporting cross member with guide rolls at each end. These guide rolls are mounted on pivoted arms that extend at right angles to the idler in the direction from which the belt approaches. The arms are held in place by a removable locking pin. By swinging the arms through 180 degrees and putting the locking pin in place on the opposite side, the guides are ready to train the belt when traveling in the reverse direction. Lack of pressure between the guide rolls and the belt is claimed to prevent damage to the edge of the belt. The guide roll moves outwardly when the belt touches it, and in so doing swivels the idler and causes the belt to return to normal position.



New belt idler which is claimed not to wear edges of belt

Grinding Machines

Hammond Machinery Builders, Kalamazoo, Mich., has added a new series of wide-swing grinders to its line. The accompanying illustration shows the 2 and 3 horsepower type, but others up to 7½ horsepower can be supplied. On the machine illustrated the wheels are spaced on 30-inch centers, and the spindle is 41 inches long. In design of the machine it is claimed that particular attention has been given to provide maximum space around the wheels to give working space for the handling of bulky pieces. On the machines totally enclosed motors are employed and bearings are sealed against entrance of abrasive matter. Shatter proof eye shields and magnetic starter with overload and low voltage protection are supplied.



Wheels are arranged to provide working space for handling bulky pieces

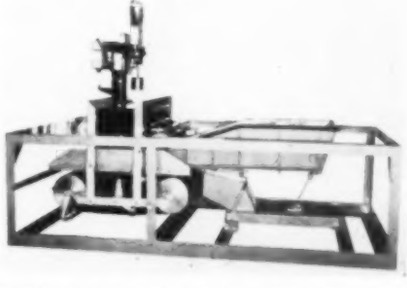
Disk Respirator

Willson Products, Inc., 262 Thorn street, Reading, Pa., has developed a new dual-disk respirator for protection against type A or nuisance dusts. The respirator, designated as No. 750, employs inexpensive throw-away filters, and bears approval of the United States Bureau of Mines. Only one filter is needed for each holder, and either side of the filter may face out so that the wearer has no difficulty in making filter changes when desired. The dual-disk filters provide 28 square inches of filtering surface, and it is claimed that they offer little resistance to breathing.

Dual disk respirator employs inexpensive throw-away filters

Continuous Feeder

Syntron Co., 540 Lexington avenue, Homer City, Pa., recently has placed on the market an automatic, continuous weigh feeder designed to provide a steady flow of bulk materials such as sand, coal and dry chemicals. The machine is composed of a vibratory feeder conveyor discharging onto a belt conveyor suspended from a beam scale. Electric valves, claimed to function on the slightest under-weight or over-weight movement of the scale beam, control the speed of the vibratory



Continuous weigh feeder designed for handling bulk materials

American Foundrymen's Association Makes Changes in Organization

AT the annual meeting of the board of directors of the American Foundrymen's association, held May 20 in Cleveland at the time of the annual convention, the newly elected president, Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., and vice president elect, Henry S. Washburn, Plainville Casting Co., Plainville, Conn., were installed in office. The board then recessed until July 26, meeting in Chicago, and completed its organization for the year.

C. E. Hoyt

Two vacancies on the board, occasioned by the recent death of director Frederick A. Lorenz Jr., and the resignation of director D. O. Thomas, were filled by the election of A. Walcher, vice president, American Steel Foundries, Chicago, and William H. Doerfner, works manager, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich.

C. E. Hoyt was re-elected executive vice president and manager of exhibits. As Dan M. Avey, who has been secretary-treasurer for the past year, presented his resignation, Robert E. Kennedy, technical secretary, was elected secretary, E. O. Jones, treasurer and director of safety and hygiene, and Miss Jennie Reininga was re-elected assistant secretary-treasurer. Norman F. Hindle, assistant technical secretary, was elected technical secretary.

The board completed its organization by electing four of its members to serve with the president, vice president and executive vice president as an executive committee, the four elected being Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala., Hyman Bornstein, Deere & Co., Moline, Ill., H. S. Hersey, C. O. Bartlett & Snow Co., Cleveland, and W. H. Doerfner, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich.

The board considered invitations from several cities for holding the 1939 annual convention. No definite place was selected but a committee was authorized to consider the time, place and character of the next convention and report back to the board for final decision.

R. E. Kennedy

This report of the meeting of the board of directors was received as the last form of the August issue was on the press. Personal sketches of the new officers will be presented in the September issue of The Foundry.

THE EDITORS

feeder. The scale functions only as a scale, exerting no mechanical power to operate the electric control valves. The feeder is of the pulsating, electro-magnet type and conveys materials by vibration. Capacity is from several pounds to 25 tons per hour.

Tool Balancer

Independent Pneumatic Tool Co., 600 West Jackson boulevard, Chicago., recently has placed on the market a new device for suspending large electric and pneumatic drills, and other tools above the working location. The new equipment not only supports the tool, but also absorbs the torque and eliminates danger of injury to an operator when the tool sticks. It is claimed that ease of handling and positive load control are obtained because the device is adjusted to balance in working position. No effort is required to lift or hold the tool or fight the torque.

The balancers are made with a range of travel from 3 to 6 feet and a load capacity from 45 to 100 pounds. Complete weight is 143 pounds. The torque arm telescopes to allow maximum travel when open and minimum head room when closed. It is attached at the top to the load frame in a rocking bracket that permits the tool to be swung backward or forward to either side. A yoke bracket at the bottom accommodates all shapes and sizes of yokes. Special yokes can be supplied to attach to tools in any convenient manner. The telescoping tube is square so that tools may be suspended either vertically or horizontally. Each telescope arm is provided with a limit stop which acts as a double safety device.

Refractory Brick

Laclede-Christy Clay Products Co., St. Louis, is marketing a new diaspore, refractory brick for numerous applications including nonferrous crucible furnaces, reverberatory furnaces, roofs and upper sidewalls of electric arc furnaces, and complete linings for rotary, indirect arc furnaces. Pyrometric cone equivalent of the brick is 36-37 or 3300 degrees Fahr., making it suitable for furnaces with operating temperatures near or slightly above 3000 degrees Fahr. The brick is claimed to be nonspalling, nonshrinking, and resistant to many types of slag. To obtain best results from the brick first quality high temperature cement or finely ground diaspore clay is employed in setting them up.

Resin Fills Pores

General Plastics, Inc., Walck road, North Tonawanda, N. Y., has developed an impregnating resin for increasing the density of certain types of castings. The resin in liquid form, is known as 278 impregnating resin. It is designed to eliminate slight porosity in castings, and make them pressure tight. The resin solution is impregnated in the porous sections by pressure, or vacuum and pressure. After impregnation the casting is baked at 250 degrees Fahr. or higher to set the resin. When hardened in this way it is claimed that the resin practically is unaffected by water, solvents, mild alkalies and acids.

For Melting Soft Metals, You Need

HAUSFELD FURNACES

Comparatively few foundries that make products of Aluminum, Zinc, Tin, Lead or their alloys, require as much melting equipment as this battery of Hausfeld Barrel Type Open Flame Furnaces in the plant of Aluminum Industries, Inc. But wherever soft metals are part of the output Hausfeld Furnaces, using gas or oil for fuel, will do the work faster, cheaper, and with the utmost accuracy of analysis.

Write for catalog and literature describing our revolutionary MULTIPLE BURNER FURNACES

The Campbell-Hausfeld Company

300-320 Moore Street Harrison, Ohio

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one hundred and fiftieth anniversary

THE E. & G. BROOKE IRON COMPANY

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Manufacturers of

Basic, Malleable, Foundry, Forge and Low Phosphorus Pig Iron

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BIRDSBORO, PENNSYLVANIA

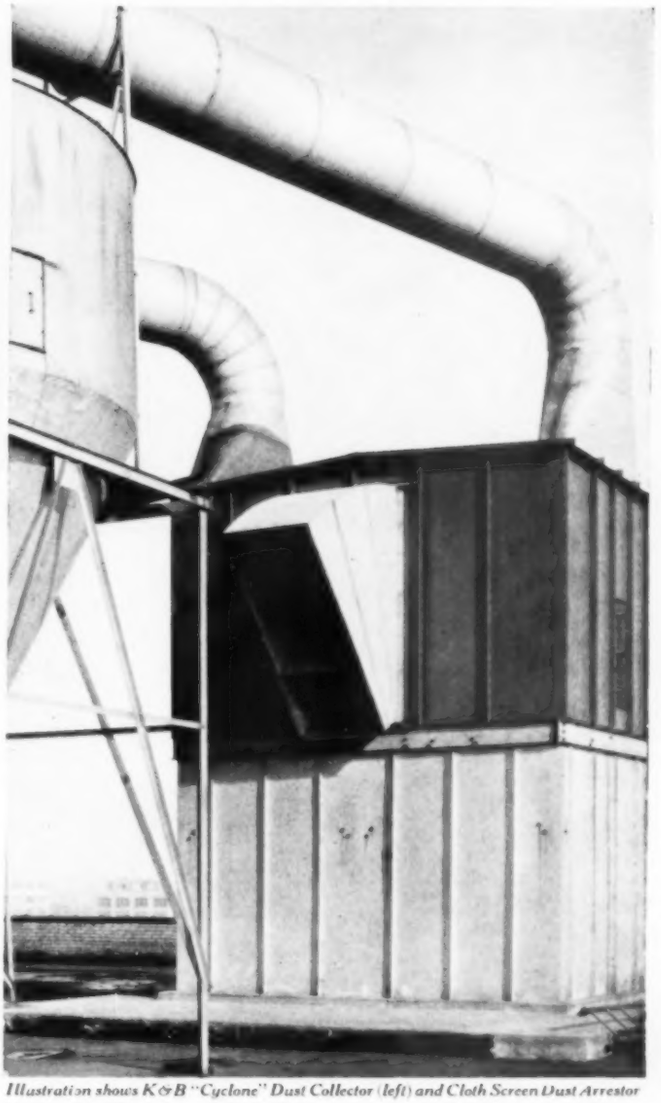


Illustration shows K & B "Cyclone" Dust Collector (left) and Cloth Screen Dust Arrestor

Put Your Dust Collecting Problems *up to* Experienced Engineers . . .

In Kirk & Blum installations either the "Cyclone" Dust Collector, Cloth Screen Dust Arrestor or Wet Collector (Precipitator) is used, singly or in combination, the selection determined by the conditions to be met. Our Engineers, who have solved the dust and fume removal problem for many of the country's industrial leaders, will make a thorough survey of your plant and recommend the type of system most suitable to meet your specific requirements. Write for details of this service and copy of new interesting books, "Dust Collecting Systems for Metal Industries," "Fan Systems for Various Industries."

THE KIRK & BLUM MFG. CO., • **2808 Spring Grove Ave., Cincinnati, O.**

Designers and Builders of Dust Collecting, Fume Removal, Ventilating Systems — Industrial Ovens — Pickling and Plating Equipment, Etc.

Chicago Representative: C. P. Guion, 1661 North Milwaukee
Pittsburgh: Bushnell Machinery Co., 311 Ross Street
Louisville: Liberty Eng. & Mfg. Co., Inc., 1450 S. 15th St.

KIRK & BLUM
Dust Collecting Systems

Hook Bolt Head

Fanner Mfg. Co., Brookside park, Cleveland, is manufacturing a new safety hook bolt head and deep washer which convert ordinary bolts into hook bolts for numerous applications in construction work. The head and washer, shown in the accompanying illustration, are made from a specially processed malleable

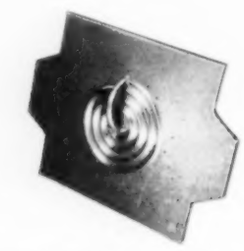
Special malleable cast iron head and washer converts ordinary bolt into a hook bolt

cast iron, and in sizes to fit bolts ranging from ¼ to 1-inch in diameter. Top of the hook bolt head is recessed to hold head of the bolt when the latter is dropped through the head. When the bolt comes up through the hook bolt head, the deep washer which fits into the recess is employed so that the nut may be turned freely. Hook bolt heads may be used at each end of a bolt when required with a deep washer at the threaded end.

Fluidity Pattern

Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, is marketing the fluidity test pattern shown in the accompanying illustration. The pattern, which is constructed according to A. F. A. specifications, is said to be useful for determining the running quality of gray, malleable, alloyed irons, and certain nonferrous metals. The pattern is said to be an accurately finished cast pattern plate made of aluminum. The spiral part of the pattern is finished accurately to metal templates so that there is no variation in test results from different patterns.

Side of the pattern on which the buttons appear is placed in the cope and the length of the spiral that the metal will run is expressed as running a definite number of buttons or inches. The buttons are two inches apart, and the total length of the spiral is 60 inches. A pouring basis with overflow and horn gate is used to minimize variations.



Fluidity test pattern is used for determining the running quality of ferrous and nonferrous metals

Tablet Dispenser

Industrial Products Co., 800 West Somerset Street, Philadelphia has placed on the market seven different sizes and types units for the dispensing of sodium chloride tablets. Features of the model shown in the accompanying illustration include

Tablet pickup and discharge in one sixth turn of operating knob in either direction

plastic case, lock top and key, visible tablet discharge, transparent tablet retaining guard prevents waste, label giving directions on proper use of tablets, easy to install, rigid metal mounting plate, wall bracket, small size, capacity 350 tablets. Larger units have a capacity of 1000, 15-grain tablets, or 1500, 10-grain tablets. Group packages, 250 10-grain tablets are supplied in standard packages of 1 dozen or 6-dozen units.

Core Oil

E. F. Houghton & Co., Third, American and Somerset streets, Philadelphia, recently has introduced a new series of core oils which include Hy-Ten core oil Nos. 4 and 5. It is claimed that these oils provide a high green bond strength, will not gum or stick in the boxes, and also make the mixtures usable the following day. The Houghton company has installed new equipment to manufacture these oils in volume.

Percy M. Brotherhood & Son, machine tool dealers and agents, have transferred their offices to the South Ferry building, 44 Whitehall street, New York.

Grinding Machine

United States Electrical Tool Co., Cincinnati, O., has placed on the market a new grinding machine which is claimed to possess numerous features. The machine, shown in the accompanying illustration, is equipped with a totally enclosed, ball bearing, fan cooled motor mounted on a hinged platform for belt adjustment. Heavy wheel flanges keyed to the spindle are provided with adjustable weights mounted in grooves for balancing

New grinding machine has wheel guard interlocked with variable speed transmission

wheels. Wheel guards are adjustable to accommodate wheel wear and have permanent exhaust connections.

Safety eye shields are mounted on the guards. The machine has a variable speed transmission interlocked with the wheel guards so that the proper speed for a given size wheel only can be used. Wheels are mounted on a heavy chromium-manganese steel spindle which runs on 4 heavy duty bearings enclosed in dustproof housings with inner and outer labyrinth seals. Correct surface speed of the wheels is maintained by increasing rotation of spindle as the wheel wears down.

Adventures of Bill

(*Concluded from page* 53)

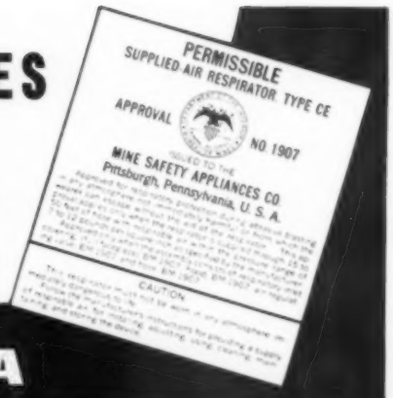
carding. Workmen engaged in this part of the job were known as carders. Funny how some of the old terms persist through the centuries. We still have the carders. All quiet along the Potomac now, but you can remember Bill when it made quite a difference whether you were a white carder or a red carder, whether you fought under the banner of John Penton or Martin Fox.

"There y'are," said Bill. "A very noble piece of work."

"My regards to Bro. Babbitt," I said, "and my admiration for a highly illuminating and scholarly comment. The first molder I ever knew who could qualify for a card in the N. & P. U. of J. P. of N. A., National & Protective Union of Journeymen Preachers of North America."

NOW U. S. BUREAU OF MINES *Approved...*

(UNDER APPROVAL NO. 1907)

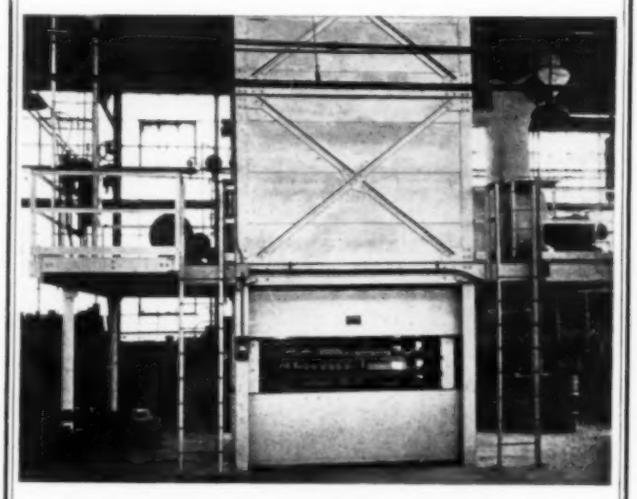


The M.S.A ABRASIVE MASK

Official approval has been extended the M.S.A. Abrasive Mask by the U.S. Bureau of Mines, for *complete protection in shot and sandblasting operations.* This formal recognition corroborates the research of M.S.A.'s own laboratories, and the experience of users everywhere. On a par with *safety* is the M.S.A. Abrasive Mask's *comfort, lightness, coolness, durability and working freedom* . . . its many *exclusive* features making for greatest convenience and utility. You'll be interested in the complete details of this lightweight Mask—write for them! (And if you wish, we'll be glad to demonstrate it to you).

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS, PITTSBURGH, PA.
DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

VERTICAL CORE OVENS
By
Carl-Mayer



Oil Fired Vertical Oven—Patent Pending, built for a General Motors Subsidiary

Also all
OTHER TYPE CORE AND MOLD OVENS
Write for literature to:

THE CARL-MAYER CORP.
3030 EUCLID AVE. CLEVELAND, OHIO

YOU'RE TELLING ME --

that your castings must peel easily and have fine finish, and I'm telling you that our #1212 general purpose Ceylon Plumbago will walk away with the job. It has been "tops" in lots of foundries for many years, and if you will write me for a sample, I'll bet it will be "tops" with you too.

Bill Jagger

We Manufacture

Seacoals, 10 different grinds.

Core Compounds, Plumbagos, Blackings, Core Washes -- in grades for every purpose.

Parting Compounds: Tripoli, Non-Silica, Liquid.

Core Paste, Paste Binder, Dust On Facing, Special Facings and Compounds to fit any job.

We Distribute

Glutrin Goulac Purite
"Volclay" Wyoming Bentonite
Soapstones Silica Flour

LEADERS FOR 59 YEARS..
The Smith Facing & Supply Co.
1857 Carter Rd., Cleveland, Ohio

RADIANT FACINGS Since 1879

FOUNDRY ACTIVITIES

COLONIAL Foundry Co., Louisville, O., has opened its plant and again is in full production, following a recent fire. The fire was confined entirely to the foundry and the four pattern storage buildings were unharmed. The company has received several large orders which are keeping it busy, and anticipates a further pick-up in the near future.

* * *

American Brake Shoe & Foundry Co. of California has changed its name to the American Brake Shoe & Foundry Co. Pacific Coast division. Headquarters are at 1010 Russ Building, San Francisco.

* * *

Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., recently has installed a duplexing electric furnace manufactured by the Pittsburgh Lectromelt Furnace Corp. for the production of automotive cylinder irons. The furnace has an hourly capacity of 6 tons.

Litchfield plant of the American Radiator Co., closed for more than a year, is reported to have resumed operations with a nearly full working force and additional shifts.

* * *

P. & W. Brass Foundry, Plano, Ill., has been moved from its old address to the Jake Passage building. The old building was recently flooded.

* * *

Central Foundry Co., Marshalltown, Iowa, recently was dissolved by action and consent of its stockholders.

* * *

Williams Foundry Co., Chicago, recently was dissolved. Correspondent is Church & Trasler, 10 South LaSalle street, Chicago.

* * *

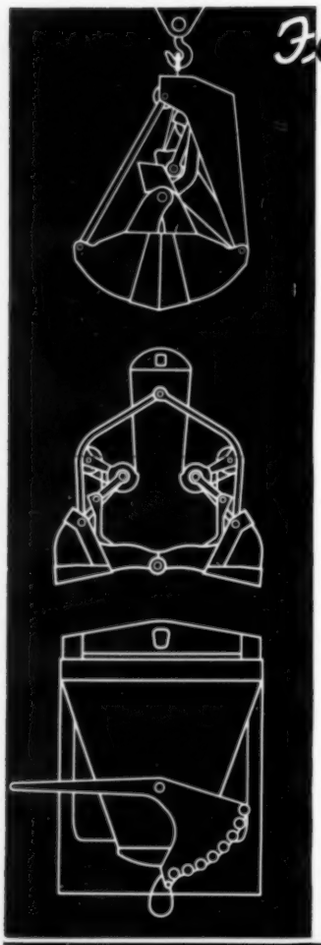
Weidenmiller Foundry Corp., 5315 North Ravenswood avenue, Chicago, has been organized with 100 shares of common stock at $100 per share by E. H. Weidenmiller, P. M. Weidenmiller, and C. C. Schy to manufacture, design, buy and sell patterns and castings.

* * *

Pullman-Standard Car Mfg. Co., 79 East Adams street, Chicago, will

(*Concluded on page* 102)

BLAW-KNOX
BUCKETS
For Foundry Service



The popular hook-on bucket for handling sand, coke, coal, etc. Adaptable to a broad range of service and multiplying the value of your crane investment.

A Hook-on type of bucket built especially to meet the requirement of extremely limited head room clearance for operation.

The roller gate dump bucket presenting the first practical means of obtaining controllable discharge for delivering sand to floor or flasks, etc.

ADDRESS INQUIRIES TO

BLAW-KNOX DIVISION
★ OF BLAW-KNOX COMPANY ★
2097 Farmers Bank Building • Pittsburgh, Pa.

RAW MATERIAL PRICES
July 25, 1938

Iron	
No. 2 foundry, Valley	$20.00
No. 2 Southern Birmingham	16.00
No. 2 foundry, Chicago	20.00
No. 2 foundry, Buffalo	20.00
Basic, Buffalo	19.00
Basic, Valley	19.50
Malleable, Chicago	20.00
Malleable, Buffalo	20.50
Charcoal iron, furnace	25.00
Coke	
Connellsville beehive premium	$5.75 to $6.25
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$11.00 to $11.50
Heavy melting steel, Pittsburgh, No. 2	13.00 to 13.50
Heavy melting steel, Chicago, No. 2	10.25 to 10.75
Stove plate, Buffalo	12.00 to 12.50
Stove plate, Chicago	9.50 to 10.00
No. 1 cast, New York	11.50 to 12.00
No. 1 cast, mchy., Chicago	12.00 to 12.50
No. 1 cast, Pittsburgh	14.50 to 15.00
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	13.00 to 13.50
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	13.25 to 13.75
Railroad malleable, Chicago	14.50 to 15.00
Malleable, Buffalo	13.50 to 14.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.52½
Straits tin	43.70
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	13.25 to 13.50
Lead, New York	4.90
Antimony, New York	10.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.75

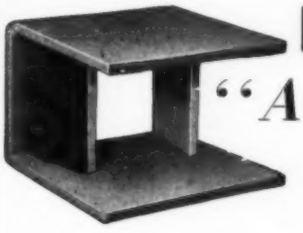
"Savings" ARE IN THE BAG

If you check your cleaning requirements against actual STEELBLAST operation data, you will find the answer to most cleaning problems. You need STEELBLAST abrasives for best results—They are tougher, sharper, faster and safer. May we show you?

STEELBLAST ABRASIVE CO.
6536 Carnegie Ave.
Cleveland, O.

FAST
▼
DUSTLESS
▼
ECONOMICAL

STEELBLAST
SHOT *and* GRIT
FOR BETTER CLEANING



MILWAUKEE
"*ANGLE*"
CHAPLETS

"MEET" the new addition to our line, and a fit companion to the famous MILWAUKEE THREAD STEM Single and Double Head Chaplets.

"Use" MILWAUKEE 'ANGLE' CHAPLETS—they are indispensable for some jobs. Write for prices and information. Also test our unequaled service.

MILWAUKEE CHAPLET & MFG. CO.
1023 So. 40th St., Milwaukee, Wis.
Manufacturers of Foundry Chaplets, Galvanized Riddles, Kordo Core Paste, Tripolex and Non Silica Partings

DEPENDABLE
JOLT SQUEEZERS

	No. 81	No. 91	No. 101
Jolt Cyl.	3"	4"	5"
Squeeze Cyl.	8½"	10"	13"
Between Uprights	32"	36"	38"

ARCADE MANUFACTURING CO.
Freeport, Illinois

FOR BLOWING CORES
INSIST ON
SMILLIE VENTS
for

- Greater Vent Area
- No loss of sand
- No Saggy Cores
- Longer Life
- Machinable for Contours
- Sturdy Construction

Sizes from ⅛" to 1" in ⅛" steps.

We also manufacture a complete line of Flask Pins and Bushings.

Samples and prices upon request

C. M. SMILLIE & CO.
520 E. Larned St. Detroit, Mich.

COMB'S GYRATORY RIDDLES

Greatly Reduce Riddling Costs Through Speed and Labor Saving

Available in four types and sizes, Comb's Gyratory Riddles are noted for their low maintenance cost (½c to 1c per hour) and their enormous capacity.

• • •

30 DAYS FREE TRIAL

Write for descriptive catalogue; choose the type best suited to your needs and use it for 30 days. We pay the freight both ways if you decide to return it!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas

(*Concluded from page* 100)

build a one-story addition to its plant at Michigan City, Ind., for production of car wheels. Estimated cost with equipment will be $400,000.

* * *

John Westwick & Son Inc., Galena, Ill., after spending several months in the development of a new combination heating unit and air conditioner, recently hired 55 additional men and began manufacture of the unit. The foundry had been closed since February.

Akron Standard Mold Co., Akron, O., has installed a three-ton electric furnace manufactured by the Pittsburgh Lectromelt Furnace Corp., Pittsburgh.

* * *

Index of foundry equipment orders for June, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 61.2 as compared with 90.6 in May and 228.2 in June, 1937. Index of shipments was 78.5 as compared with 91.3 in May and 232.1 in June of last year.

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

MELTING—An interestling booklet entitled, "Economical Foundry Melting" has been published by the Whiting Corp., Harvey, Ill., the text covers considerable information on the cupola, the rotary bracklesberg furnace, the cradle furnace, the air furnace, the side blow converter and duplexing equipment. The catalog is well illustrated with various views of the equipment in operation.

PAINT STICK—A folder recently issued by Markal Co., 6 East Lake street, Chicago, describes its paint stick for marking hot and cold surfaces.

BRONZE VALVES — Hancock Valve Division of Manning, Maxwell & Moore Inc., Bridgeport, Conn., has published bulletin 4-4500 which describes all types of bronze valves and some steel valves.

DIESEL GENERATORS — Booklet No. 4658 issued by Caterpillar Tractor Co., Peoria, Ill., cites the wide range of services met by their diesel powered electric generators.

SAFETY DEVICES—Willson Products Inc., Reading, Pa., recently issued a new catalog of industrial safety devices. This well illustrated presentation covers a complete line of eye, nose, throat and lung protectors for industrial workers.

BOILER METERS — Bailey Meter Co., 1050 Ivanhoe road, Cleveland, has published a 32-page bulletin called "Bailey Boiler Meters." An analysis of 7000 combustion tests on various types and sizes of boilers is given.

SOCKET INSTRUMENTS — Application and construction details of outdoor and indoor service socket instruments are explained in a new 20-page booklet issued by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

NICKEL-COPPER ALLOY—H. Kramer & Co., Chicago, has issued a 4-page folder describing its nickel-copper alloy for addition to gray cast iron. The alloy, called Improvite, is used in amounts from 1 to 3 per cent, and is claimed to produce beneficial effects such as reduced grain size, controlled chill, improved machinability, increased wear resistance, strength and toughness, and corrosion resistance.

PILLOW BLOCKS — A folder describing a cast steel self-aligning pillow block equipped with roller bearings recently has been issued by Palmer-Bee Co., Westminster and Grand Trunk railroad, Detroit.

CLEANING — Homestead Valve Mfg. Co., Coraopolis, Pa., has published a folder dealing with its equipment for cleaning with steam vapor spray. The unit is a pressure spray, water heater, and solution tank combined in a simple, fully automatic, compact, portable unit.

TRANSMISSIONS — Stephens-Adamson Mfg. Co., Aurora, Ill., has published catalog No. 68 dealing with variable reducer transmissions. Various types and applications of this single unit variable speed transmission and speed reducer are given.

DUST CONTROL—W. W. Sly Mfg. Co., 4700 Train avenue, Cleveland, recently has published a bulletin on dust control which gives an extensive resume of cloth type filters produced by that company and the application of the filters to many dust control problems. General information is presented on dust control equipment and installation. The 24-page bulletin is well illustrated.

TUYERES — A description of the construction and operation of its new tuyere has been published by the Zippler Tuyere Systems, 608 Throp street N. S., Pittsburgh. It is pointed out that the tuyere can be installed with little expense.

PYROMETERS—"Throttling Control of Electric Furnaces" is the title of bulletin No. 1173 recently issued by C. J. Tagliabue Mfg. Co., Park and Nostrand avenues, Brooklyn, N. Y. The publication gives diagrams and specifications of indicating potentiometer pyrometers and controllers.

BARREL RACKS—Bulletin No. 403, recently published by Barrett-Cravens Co., 3255 West Thirtieth street, Chicago, describes vertical and horizontal barrel racks and portable elevators. The bulletin shows uses and designs of the barrel racks and illustrates the types of portable elevators.

HOISTS AND DERRICKS—Two catalogs and one bulletin have been published recently by American Hoist & Derrick Co., St. Paul, which describe gasoline and electric hoists, steel derricks and shovels. These publications are well illustrated and give specific data and information on these machines.

CORE PASTE — Eastern Clay Products, Inc., Elfort, O., has published a folder giving information on the use and comparative strength of its core paste when air dried 9 hours, air dried 20 hours and oven dried 30 minutes at 225 degrees Fahr. Other products of the Eastern company are listed.

CRUCIBLES — A catalog on its complete line of crucibles, retorts, ladle liners, graphite dippers, aluminum melting crucibles, graphite spelter or brazer bowls, lead burning boxes, pouring troughs, furnace covers, base blocks etc. has been published by the American Crucible Co., 283 Canal street, Shelton, Conn.

MAGNETS — A catalog entitled "The Economical Method for Metal Handling", has been published by the Dings Magnetic Separator Co., Milwaukee, and describes its high intensity lifting magnets. The publication also includes information on pulleys and pulley type separators, drum and drum type separators, wet type separators, and magnetic equipment for special applications.

REFRACTORY CEMENT—Quigley Co., 56 West Forty-Fifth street, New York, has issued a new bulletin on a neutral chrome base refractory cement used for laying fire brick, chrome, magnesite, and other refractory brick and tile in metallurgical and boiler furnaces where extreme temperatures and destructive slagging, chemical and abrasive actions are encountered.

DUST COLLECTORS — Kirk & Blum Mfg. Co., Cincinnati, has published three catalogs covering fan systems for various industries, blower systems for woodworking plants and dust collecting systems in metal industries. Each publication is exceptionally well illustrated with installation photographs to illustrate the application of the equipment manufactured by that company to a wide variety of industrial plants. A folder issued by that company deals with pickling baskets and crates, lead lined steel tanks and fume exhaust systems.

Faked Foundry Facts

"Shaking out Tongs"